



FRIDAY, AUGUST 3, 1877.

## MASTER MECHANICS' ASSOCIATION.

## Tenth Annual Convention.

## REPORT OF COMMITTEE ON LOCOMOTIVE TESTS.

To the American Railway Master Mechanics' Association:  
GENTLEMEN—Your committee appointed at the last annual meeting to report on the subject of "Locomotive Tests" would respectfully report that, early after the adjournment, they prepared the following circulars:

"DEAR SIR—The undersigned, a committee appointed at the last annual convention of the American Railway Master Mechanics' Association, to report on the subject of 'Locomotive Tests,' respectively desire the co-operation of Members of the Association, in furnishing to them any record of tests they have made, or may make prior to next annual meeting.

"1st. Comparative tests of several classes or kinds of locomotives as to number of cars hauled by each class, giving weight and dimensions of each class; pressure of steam carried; kind and quantity of fuel consumed; miles run; kind of exhaust, single or double nozzle; diameter of nozzle; condition of road, grades, curves, etc.

"2d. Have you made any tests in burning fuel in locomotives, and what kind gives best results as regards economy? State whether plain fire-box, water-table or brick arch was used. If convenient, please give sketch of same, including stack and arrangement in smoke box.

"3d. Give results of any tests of a general character that will be of interest and value to the Association.

"The committee desire the members to give the Association the benefit of their experience relative to the above subject, that it may be placed on record for reference. A blank form is here appended, in which the weight and dimensions of engines can be conveniently entered."

In answer to the above circular, we have to report no replies received, until a few days ago, we received a very elaborate and complete report of a series of experiments, or tests, conducted and furnished by one of our members, John E. Martin, Master Mechanic of the Chillan & Talcahuano Railway, of Chili, South America. The test was made with American engines, as will be seen by the report.

Owing to the late date when the above was received, your committee desires to present it as part of their report, and recommend that it be read before the Association, as we think there are data and facts in it which will be of interest to the members present, and also that it be printed in our next annual report. This paper is accompanied with indicator cards, diagrams and drawings. The report shows the tests to have been carefully and thoroughly made, and we think they can be relied upon as accurate.

Your committee would recommend that the subject of "Locomotive Tests" be continued, considering it of great importance, with the hope that the members will in the future make such tests as they may find it convenient to make, even of a small character, thereby accumulating and placing on record the results of these tests, which must be of value to the Association for reference. Very respectfully,

WM. WOODCOCK,  
S. A. HODGMAN, } Committee.  
DAVID CLARKE, }

## \*LOCOMOTIVE EXPERIMENTS, BY JOHN E. MARTIN.

## EXPERIMENTS WITH NO. 4 ROGERS' MOGUL FREIGHT ENGINE.

Diameter of driving wheel, 4 ft. 7½ in.; circumference, 14.5 ft.; six revolutions of driving wheel per minute = 1 mile an hour (approximate); 364 revolutions = 1 mile.

In full gear back the valve is set ¾ in. blind in order to decrease the gain in lead in fore gear. Scale of indicator-spring was 48 lbs. = 1 inch.

[The indicator diagrams are engraved ¼ of full size.]

Sector divided into 9 notches in fore gear.

H. P. calculation from back end figure.

## EXPERIMENT JULY 7, 1876—3 IN. EXHAUST NOZZLES.



Fig. 1—Boiler pressure, 135 lbs.; revolutions, 120 per minute; 1st notch from center; not throttled.  
Cut-off ..... Front. Back.  
Lead ..... 5½ in. 5-16 in.  
Lead ..... 17-64 in. 17-64 in.  
Gross pressure, 63.8 lbs.; back pressure, 7.4 lbs.; mean pressure, 56.4 lbs.; (152)2 = 304 H. P.



Fig. 2—Boiler pressure, 139 lbs.; revolutions, 120 per minute; 2d notch; not throttled.  
Cut-off ..... Front. Back.  
Lead ..... 6½ in. 6½ in.  
Lead ..... 15-64 in. 15-64 in.  
Gross pressure, 63.8 lbs.; back pressure, 7.4 lbs.; mean pressure, 56.4 lbs.; (152)2 = 304 H. P.



Fig. 3—Boiler pressure, 135 lbs.; revolutions, 124 per minute; 3d notch; not throttled.  
Cut-off ..... Front. Back.  
Lead ..... 8½ in. 8½ in.  
Lead ..... 7-32 in. full. 7-32 in. full.



Fig. 4—Boiler pressure, 129 lbs.; revolutions, 131 per minute; 4th notch from center; not throttled.  
Cut-off ..... Front. Back.  
Lead ..... 10½ in. 9½ in.  
Lead ..... 7-32 in. 7-32 in.



Fig. 5—Boiler pressure, 129 lbs.; revolutions, 112 per minute; 4th notch; not throttled.  
Cut-off ..... Front. Back.  
Lead ..... 10½ in. 9½ in.  
Lead ..... 7-32 in. 7-32 in.  
Gross pressure, 76.6 lbs.; back pressure, 5.6 lbs.; mean pressure, 71 lbs.; (206)2 = 412 H. P.



Fig. 6—Boiler pressure, 130 lbs.; revolutions, 120 per minute; 5th notch; throttled.  
Cut-off ..... Front. Back.  
Lead ..... 12½ in. 12½ in.  
Lead ..... 7-32 in. 7-32 in.



Fig. 7—Boiler pressure, 135 lbs.; revolutions, 101 per minute; 5th notch from center; not throttled.  
Cut-off ..... Front. Back.  
Lead ..... 12½ in. 12½ in.  
Lead ..... 7-32 in. 7-32 in.  
Gross pressure, 87.8 lbs.; back pressure, 4.6 lbs.; mean pressure, 83.2 lbs.; (220)2 = 440 H. P.



Fig. 8—Boiler pressure, 124 lbs.; revolutions, 120 per minute; 6th notch from center; throttled.  
Cut-off ..... Front. Back.  
Lead ..... 14-16 in. 14½ in.  
Lead ..... 11-64 in. 11-64 in. full.  
Gross pressure, 81.9 lbs.; back pressure, 8 lbs.; mean pressure, 73.9 lbs.; (230)2 = 400 H. P.



Fig. 9—Boiler pressure, 145 lbs.; revolutions, 148 per minute; 6th notch; throttled.  
Cut-off ..... Front. Back.  
Lead ..... 14-16 in. 14½ in.  
Lead ..... 11-64 in. 11-64 in. full.

## EXPERIMENT AUG. 18, 1876.

¾ in. exhaust nozzles; height of exhaust nozzles above bottom of smoke-box, 12 in.; petticoat pipe, top half 5 in. below base of stack, bottom half 13 in. above bottom of smoke-box. The weight of train given (cars and freight) is exclusive of engine and tender. Weight of engine and tender is about 54 gross tons.



Fig. 10—Boiler pressure, 140 lbs.; revolutions, 116 per minute; 1st notch from center; not throttled; vacuum 1½ in.  
Train, 27 box cars; weight, 969,920 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 8½ in. 5-16 in.  
Lead ..... 17-64 in. 16-64 in.

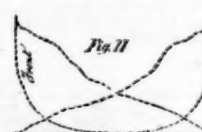


Fig. 11—Boiler pressure, 130 lbs.; revolutions, 128 per minute; 2d notch; not throttled; vacuum, 2½ in.  
Train, 929,600 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 6½ in. 6½ in.  
Lead ..... ¾ in. full. 15-64 in.



Fig. 12—Boiler pressure, 123 lbs.; revolutions, 172 per minute; 3d notch; not throttled; vacuum, 1½ in.  
Train, 969,920 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 8½ in. 8½ in.  
Lead ..... ¾ in. 7-32 in.



Fig. 13—Boiler pressure, 138 lbs.; revolutions, 72 per minute; 4th notch; throttled.  
Train, 26 box cars, 929,600 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 10½ in. 9½ in.  
Lead ..... 7-32 in. full. 7-32 in. full.



Fig. 14—Boiler pressure, 112 lbs.; revolutions, 132 per minute; 5th notch; not throttled; vacuum, 4½ in.  
Train, 969,920 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 12½ in. 12½ in.  
Lead ..... 7-32 in. 7-32 in.

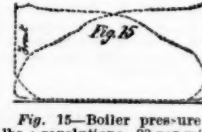


Fig. 15—Boiler pressure, 120 lbs.; revolutions, 92 per minute; 6th notch; throttled; vacuum, 4½ in.  
Train, 969,920 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 11-64 in. 11-64 in. full.

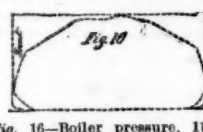


Fig. 16—Boiler pressure, 112 lbs.; revolutions, 68 per minute; 7th notch; not throttled; vacuum, 3½ in.  
Train, 969,920 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 16½ in. 16½ in.  
Lead ..... 9-64 in. 5-32 in.

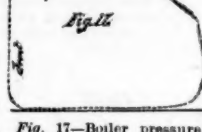


Fig. 17—Boiler pressure, 145 lbs.; revolutions, 60 per minute; 8th notch; not throttled; vacuum, 5½ in.  
Train, 969,920 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 18½ in. 18½ in.  
Lead ..... 3-32 in. 3-32 in.

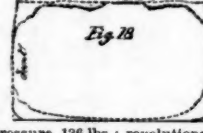


Fig. 18—Boiler pressure, 136 lbs.; revolutions, 68 per minute; 9th notch, or full gear; not throttled; vacuum, 6½ in.  
Train, 969,920 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 20-16 in. 20½ in.  
Lead ..... 0 1-64 in.

## EXPERIMENT OCT. 7, 1876.

¾ in. exhaust nozzles, 27 in. above bottom of smoke-box, or about on level with second row of upper tubes. Petticoat pipe, top half 5 in. below base of smoke-stack, and bottom half 12 in. above bottom of smoke-box.



Fig. 19—Boiler pressure, 140 lbs.; revolutions, 116 per minute; 1st notch from center; not throttled; vacuum, 1½ in.; water, full glass; damper open.  
Train, 31 box cars, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 17-64 in. 17-64 in.



Fig. 20—Boiler pressure, 140 lbs.; revolutions, 132 per minute; 1st notch; not throttled; vacuum, 1½ in.; water, full glass; damper open.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 17-64 in. 17-64 in.

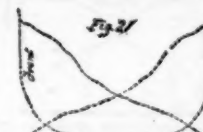


Fig. 21—Boiler pressure, 140 lbs.; revolutions, 120 per minute; 2d notch; not throttled; vacuum, 2 in.; water, full glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 6½ in. 6½ in.  
Lead ..... ¾ in. full. 15-64 in.

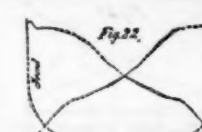


Fig. 22—Boiler pressure, 137 lbs.; revolutions, 60 per minute; 3d notch; not throttled; vacuum, 2 in.; water ¾ glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 8½ in. 8½ in.  
Lead ..... ¾ in. 7-32 in. full.

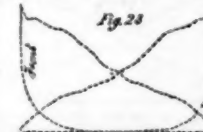


Fig. 23—Boiler pressure, 138 lbs.; revolutions, 96 per minute; 3d notch; not throttled; water, ¾ glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 8½ in. 8½ in.  
Lead ..... ¾ in. 7-32 in. full.

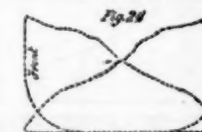


Fig. 24—Boiler pressure, 131 lbs.; revolutions, 80 per minute; 4th notch; not throttled; vacuum, 2½ in.; water, ¾ glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 8½ in. 9½ in.  
Lead ..... 7-32 in. full. 7-32 in. full.



Fig. 25—Boiler pressure, 128 lbs.; revolutions, 116 per minute; 4th notch; not throttled; vacuum, 3 in.; damper open; water, full glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 10½ in. 9½ in.  
Lead ..... 7-32 in. full. 7-32 in. full.



Fig. 26—Boiler pressure, 136 lbs.; revolutions, 76 per minute; 4th notch; not throttled; water, ¾ glass; damper open.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 10½ in. 10 in.  
Lead ..... 7-32 in. 7-32 in.

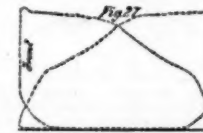


Fig. 27—Boiler pressure, 135 lbs.; revolutions, 68 per minute; 5th notch; not throttled; water, ¾ glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 12½ in. 12½ in.  
Lead ..... 7-32 in. 7-32 in.



Fig. 28—Boiler pressure, 138 lbs.; revolutions, 136 per minute; 5th notch; not throttled; vacuum, 4½ in.; water, full glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 12½ in. 12½ in.  
Lead ..... 7-32 in. 7-32 in.



Fig. 29—Boiler pressure, 140 lbs.; revolutions, 160 per minute; 5th notch; not throttled; vacuum, 4½ in.; water, ¾ glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 12½ in. 12½ in.  
Lead ..... 7-32 in. 7-32 in.



Fig. 30—Boiler pressure, 142 lbs.; revolutions, 84 per minute; 5th notch; throttled; water, full glass.  
Train, 1,142,400 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 12½ in. 12½ in.  
Lead ..... 7-32 in. 7-32 in.

## EXPERIMENT NOV. 23, 1876.

Height of exhaust nozzles above bottom of smoke-box, 12 in. Exhaust nozzles, ¾ in.

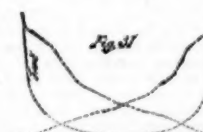


Fig. 31—Boiler pressure, 131 lbs.; revolutions, 120 per minute; 1st notch; not throttled; vacuum, 1½ in.; water, full glass; damper open.  
Train, 613,760 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 5½ in. 5-16 in.  
Lead ..... 17-64 in. 15-64 in.



Fig. 32—Boiler pressure, 140 lbs.; revolutions, 84 per minute; 1st notch; not throttled; vacuum, 1½ in.; water, full glass; damper open.  
Train, 613,760 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 5½ in. 5-16 in.  
Lead ..... 17-64 in. 15-64 in.



Fig. 33—Boiler pressure, 145 lbs.; revolutions, 100 per minute; 2d notch; not throttled; vacuum, 2 in.; water, ¾ glass; damper open.  
Train, 672,000 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 6½ in. 6½ in.  
Lead ..... ¾ in. full. 15-64 in.



Fig. 34—Boiler pressure, 135 lbs.; revolutions, 152 per minute; 2d notch; not throttled; vacuum, 2 in.; water, ¾ glass; damper open.  
Train, 613,760 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 6½ in. 6½ in.  
Lead ..... ¾ in. full. 15-64 in.

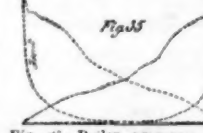


Fig. 35—Boiler pressure, 140 lbs.; revolutions, 128 per minute; 2d notch; not throttled; vacuum, 2 in.; water, ¾ glass; damper open.  
Train, 613,760 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 6½ in. 6½ in.  
Lead ..... ¾ in. full. 15-64 in.



Fig. 36—Boiler pressure, 135 lbs.; revolutions, 116 per minute; 3d notch; not throttled; vacuum, 2½ in.; water, ¾ glass; damper open.  
Train, 672,000 lbs.  
Cut-off ..... Front. Back.  
Lead ..... 8½ in. 8½ in.  
Lead ..... ¾ in. 7-32 in. full.

\*Accompanying the diagrams and the table following is an explanatory letter by Mr. Martin, which for want of room we cannot publish this week.—EDITOR.



Fig. 37—Boiler pressure, 128 lbs.; revolutions, 166 per minute; not throttled; 3d notch; vacuum, 3 in.; water, 1/2 glass; damper open.  
Train, 672,000 lbs.  
Front. Back.  
Cut-off.....8 1/2 in. 7-32 in. full  
Lead.....1/4 in. 7-32 in. full



Fig. 38—Boiler pressure, 133 lbs.; revolutions, 50 per minute; 4th notch; not throttled; vacuum, 2 1/2 in.; water, 1/2 glass.  
Train, 672,000 lbs.  
Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 39—Boiler pressure, 138 lbs.; revolutions, 96 per minute; 4th notch; not throttled; vacuum, 3 in.; water, 1/2 glass; damper and door open.  
Train, 672,000 lbs.  
Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 40—Boiler pressure, 133 lbs.; revolutions, 150 per minute; 4th notch; not throttled; vacuum, 3 1/2 in.; water, 1/2 glass; damper open.  
Train, 613,760 lbs.  
Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 41—Boiler pressure, 140 lbs.; revolutions, 150 per minute; 4th notch; not throttled; vacuum, 4 in.; water, 1/2 glass; damper open.  
Train, 613,760 lbs.  
Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 42—Boiler pressure, 125 lbs.; revolutions, 100 per minute; 5th notch; vacuum, 4 1/2 in.; not throttled; water, 1/2 glass; damper open.  
Train, 613,760 lbs.  
Front. Back.  
Cut-off.....12 1/2 in. 12 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 43—Boiler pressure, 130 lbs.; revolutions, 180 per minute; 5th notch; vacuum, 5 in.; not throttled; water, 1/2 glass; damper open.  
Train, 672,000 lbs.  
Front. Back.  
Cut-off.....12 1/2 in. 12 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 44—Boiler pressure, 126 lbs.; revolutions, 180 per minute; 6th notch; vacuum, 6 1/2 in.; not throttled; water, 1/2 glass; damper open.  
Train, 672,000 lbs.  
Front. Back.  
Cut-off.....14 5-16 in. 14 1/2 in.  
Lead.....11-64 in. 11-64 in.



Fig. 45—Boiler pressure, 140 lbs.; revolutions, 45 per minute; one in each notch; water, 1/2 glass.  
Train, 613,760 lbs.



Fig. 46—Boiler pressure, 130 lbs.; revolutions, 45 per minute; one in each notch; water, 1/2 glass.  
Train, 613,760 lbs.

#### EXPERIMENT DEC. 13 AND 21, 1876.

The vacuum given was taken with a syphon gauge filled with water and attached to smoke-box. The blast pressure was taken with a similar gauge filled with mercury, the pipe dipping into the nozzle about 1 in. Petticoat pipe, top half 5 in. below base of smoke-stack; bottom half 13 in. above bottom of smoke-box. Area of piston, 213.82 sq. in. Clearance and steam passages taken at 330 cub. in.; 3 1/2 in. exhaust nozzles 12 in. above bottom of smoke-box. Diagram 52 shows the work of the locomotive between Buenavista and Talamavida, a distance of 14,700 meters, or 9.134 miles. After starting the train 1 1/2 minutes, the reverse lever was put in the second notch from centre and the throttle opened wide, and the engine was run thus to Talamavida without alteration. The steam pressure was kept up steadily, varying from 137 to 141 lbs. The speed was very regular, except at one short grade, where it slackened somewhat. Time occupied in running the distance from start to stop was 25 minutes. Actual amount of water consumed, carefully ascertained, was 2,840 lbs. Water used in 25 minutes, calculated from diagram 52, was 2,850 lbs. Amount of water used in 3,325.2 revolutions (figures from same diagram taken) was 2,712 lbs. Allowing for the extra quantity of water used during the first 1 1/2 minutes and for slackened speed at arrival and on grade, we may take this card (with its higher number of revolutions than the average would be) as a good representation of the work done on the run.

#### Grades and Curves on road between Buenavista and Talamavida:

Distance.	Height above sea.	33 curves of 300 meters radius.
Buenavista.....	0 44 meters	1 " 350 "
3,100 42 "	9 "	400 "
3,900 45 "	7 "	500 "
13,151 28 "	4 "	1,000 "
Talamavida.....	14,700 42 "	

Total length of curves, 8,280 meters; total length of straight, 6,420 meters.

The actual quantity of water consumed in this run, when diagrams 47, 48, 49, 50 and 51 were taken, was 2,800 lbs., and the engine was run in the first and second notches from centre. Time occupied was 25 minutes.



Fig. 47—Dec. 13.—Boiler pressure, 138 lbs.; revolutions, 124 per minute; 1st notch from centre; not throttled; water, 1/2 glass; vacuum, 1 1/2 in.; damper open.  
Train, 672,000 lbs.  
Front. Back.  
Cut-off.....5 1/2 in. 5-16 in.  
Lead.....17-64 in. 15-64 in.  
Water used: 2.27 cub. ft. x 0.105 lbs. = 0.23835 lbs.  
0.785 " x 0.076 " = 0.05966 "  
0.23835 + 0.05966 = 0.29801 lbs. water.  
Water per minute = 88.63 lbs.  
" " hour = 5,317 lbs.  
Water per H. P. per hour = 20.2 lbs.



Gross pressure, 51 lbs.; back pressure, 9.2 lbs.; mean pressure, 41.8 lbs. (134.17) 2 = 268.34 H. P. of locomotive.

Fig. 48—Dec. 13.—Boiler pressure, 130 lbs.; revolutions, 148 per minute; 2d notch; throttled; vacuum, 1 1/2 in.; damper open; water, 1/2 glass.  
Train, 672,000 lbs.

Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.  
Water used: 2.27 cub. ft. steam x 0.098 lbs. = 0.2246 lbs. water.  
0.785 cub. ft. x 0.07 lbs. = 0.05495 lbs. water.  
0.2246 + 0.05495 = 0.27955 lbs. water.  
Water per minute = 99.16 lbs.  
" " hour = 5,950 lbs.  
Water per H. P. per hour = 20.8 lbs. (indicated).  
Gross pressure, 46.9 lbs.; back pressure, 9.6 lbs.; mean pressure, 37.3 lbs. (143) 2 = 286 H. P.

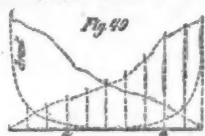


Fig. 49—Dec. 13.—Boiler pressure, 133 lbs.; revolutions, 124 per minute; 2d notch; not throttled; vacuum, 1 1/2 in.; damper open; water, 1/2 glass while working.  
Train, 672,000 lbs.

Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.  
Water used: 2.27 cub. ft. x 0.125 lbs. = 0.28375 lbs. water.  
0.785 " x 0.066 " = 0.05181 "  
0.28375 + 0.05181 = 0.33556 lbs. water.  
Water per minute = 115.04 lbs.  
" " hour = 6,902 lbs.  
Water per H. P. per hour = 20.95 lbs.  
Gross pressure, 59 lbs.; back pressure, 7.7 lbs.; mean pressure, 51.2 lbs. (164.67) 2 = 319.34 H. P.

Fig. 50—Dec. 13.—Boiler pressure, 125 lbs.; revolutions, 120 per minute; 4th notch; not throttled; water, 1/2 glass while working.  
Train, 672,000 lbs.

Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full  
Water used: 2.56 cub. ft. x 0.128 lbs. = 0.32768 lbs. water.  
0.487 " x 0.032 " = 0.03993 "  
0.32768 + 0.03993 = 0.36761 lbs. water.  
Water per minute = 138.12 lbs.  
" " hour = 8,287.2 lbs.  
Water per indicated H. P. per hour = 21.25 lbs.  
Gross pressure, 67.2 lbs.; back pressure, 6 lbs.; mean pressure, 62 lbs. (190.3) 2 = 380.6 H. P.



Fig. 51—Dec. 13.—Boiler pressure, 142 lbs.; revolutions, 68 per minute; 4th notch; not throttled; vacuum, 3 in.; damper open; water, 1/2 glass while working.  
Train, 672,000 lbs.

Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full  
Water used: 2.56 cub. ft. x 0.166 lbs. = 0.42556 lbs.  
0.487 " x 0.073 " = 0.03551 "  
0.42556 + 0.03551 = 0.46107 lbs.  
Water per minute = 168.2 lbs.  
" " hour = 6,372 lbs.  
Water per indicated H. P. per hour = 21.76 lbs.  
Gross pressure, 87.1 lbs.; back pressure, 4 lbs.; mean pressure, 83.1 lbs. (146.49) 2 = 292.84 H. P.

Fig. 52—Dec. 21.—Boiler pressure, 139 lbs.; revolutions, 140 per minute; 2d notch; not throttled; vacuum, 2 in.; damper open; blast pressure in mercury, 2 in.; water, full glass while working.  
Train, 672,000 lbs.

Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.  
Water used: 2.27 cub. ft. x 0.113 lbs. = 0.25651 lbs.  
0.785 " x 0.067 " = 0.05259 "  
0.25651 + 0.05259 = 0.30910 lbs.  
Water per minute = 114.20 lbs.  
" " hour = 6,852 lbs.  
Water per indicated H. P. per hour = 20.15 lbs.  
Gross pressure, 55.3 lbs.; back pressure, 8.5 lbs.; mean pressure, 46.8 lbs. (170) 2 = 340 H. P.

#### EXPERIMENT, FEB. 6, 1877.

Petticoat pipe, top half 5 in. below base of stack, and bottom half 13 in. above bottom of smoke-box; 4 in. single exhaust nozzle, 30 in. above the bottom of smoke-box, or about on level with top row of tubes.



Fig. 53—Boiler pressure, 140 lbs.; revolutions, 138 per minute; 2d notch; not throttled; vacuum, 1 1/2 in.; water, 1/2 glass; damper open.  
Front. Back.  
Cut-off.....5 1/2 in. 5-16 in.  
Lead.....17-64 in. 15-64 in.

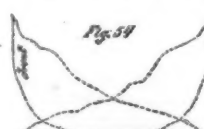


Fig. 54—Boiler pressure, 138 lbs.; revolutions, 170 per minute; 2d notch; not throttled; vacuum, 2 1/2 in.; water, 1/2 glass; damper open.  
Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in. full

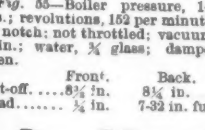


Fig. 55—Boiler pressure, 142 lbs.; revolutions, 162 per minute; 3d notch; not throttled; vacuum, 3 in.; water, 1/2 glass; damper open.  
Front. Back.  
Cut-off.....8 1/2 in. 8 1/2 in.  
Lead.....7-32 in. full 7-32 in. full

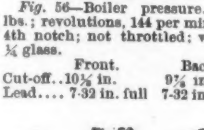


Fig. 56—Boiler pressure, 128 lbs.; revolutions, 144 per minute; 4th notch; not throttled; water, 1/2 glass.  
Front. Back.  
Cut-off.....7-32 in. full 7-32 in. full

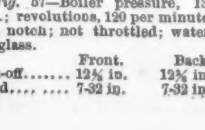


Fig. 57—Boiler pressure, 130 lbs.; revolutions, 120 per minute; 5th notch; not throttled; water, 1/2 glass.  
Front. Back.  
Cut-off.....12 1/2 in. 12 1/2 in.  
Lead.....7-32 in. full 7-32 in. full

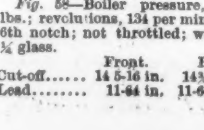


Fig. 58—Boiler pressure, 143 lbs.; revolutions, 134 per minute; 6th notch; not throttled; water, 1/2 glass.  
Front. Back.  
Cut-off.....14 5-16 in. 14 1/2 in.  
Lead.....11-64 in. 11-64 in.

#### EXPERIMENT, FEB. 8, 1877.

Petticoat pipe, top half 5 1/2 in. below base of smoke-stack, and bottom half 13 in. above bottom of smoke-box; 4 1/2 in. single exhaust nozzle, 30 in. above bottom of smoke-box.



Fig. 59—Boiler pressure, 144 lbs.; revolutions, 160 per minute; 2d notch; not throttled; water, 1/2 glass; vacuum, 3 1/2 in.  
Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.



Fig. 60—Boiler pressure, 137 lbs.; revolutions, 140 per minute; 3d notch; not throttled; water, 1/2 glass; vacuum, 3 1/2 in.  
Front. Back.  
Cut-off.....8 1/2 in. 8 1/2 in.  
Lead.....1/4 in. full 7-32 in. full



Fig. 61—Boiler pressure, 140 lbs.; revolutions, 144 per minute; 5th notch; not throttled; water, 1/2 glass; vacuum, 5 1/2 in.  
Front. Back.  
Cut-off.....12 1/2 in. 12 1/2 in.  
Lead.....7-32 in. full 7-32 in. full

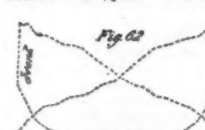


Fig. 62—Boiler pressure, 138 lbs.; revolutions, 140 per minute; 4th notch; not throttled; vacuum, 4 in.; water, 1/2 glass.  
Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full

#### EXPERIMENT, FEB. 21, 1877.

Petticoat pipe, top half 5 1/2 in. below base of stack, and bottom half 13 in. above bottom of smoke-box; 3 1/2 in. double exhaust nozzles, 27 in. above bottom of smoke-box. The vacuums are all taken with the damper and fire-door wide open.

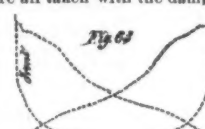


Fig. 63—Boiler pressure, 142 lbs.; revolutions, 128 per minute; 2d notch; not throttled; water, 1/2 glass; vacuum, 1 1/2 in.; blast pressure, 1 1/2 in.  
Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.

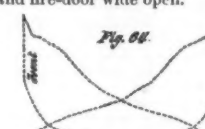


Fig. 64—Boiler pressure, 136 lbs.; revolutions, 148 per minute; 2d notch; not throttled; water, 1/2 glass; vacuum, 1 1/2 in.; blast pressure, 1 1/2 in.  
Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.



Fig. 65—Boiler pressure, 140 lbs.; revolutions, 100 per minute; 3d notch; not throttled; water, 1/2 glass; vacuum, 2 in.; blast pressure, 2 in.  
Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.

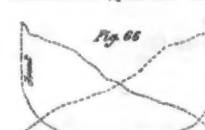


Fig. 66—Boiler pressure, 130 lbs.; revolutions, 148 per minute; 3d notch; not throttled; water, 1/2 glass.  
Front. Back.  
Cut-off.....8 1/2 in. 8 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 67—Boiler pressure, 131 lbs.; revolutions, 118 per minute; 4th notch; throttled; water, 1/2 glass; vacuum, 1 1/2 in.; blast pressure, 1 1/2 in.  
Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full

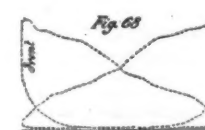


Fig. 68—Boiler pressure, 125 lbs.; revolutions, 148 per minute; 4th notch; not throttled; water, 1/2 glass; vacuum, 3 1/2 in.  
Front. Back.  
Cut-off.....10 1/2 in. 9 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 69—Boiler pressure, 132 lbs.; revolutions, 92 per minute; 5th notch; throttled; water, 1/2 glass; vacuum, 3 in.  
Front. Back.  
Cut-off.....12 1/2 in. 12 1/2 in.  
Lead.....7-32 in. full 7-32 in. full



Fig. 70—Boiler pressure, 134 lbs.; revolutions, 148 per minute; 5th notch; not throttled; water, 1/2 glass; vacuum, 4 1/2 in.  
Front. Back.  
Cut-off.....12 1/2 in. 12 1/2 in.  
Lead.....7-32 in. full 7-32 in. full

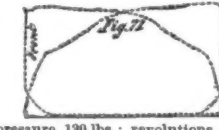


Fig. 71—Boiler pressure, 130 lbs.; revolutions, 56 per minute; 6th notch; throttled; water, 1/2 glass; vacuum, 2 1/2 in.  
Front. Back.  
Cut-off.....14 5-16 in. 14 1/2 in.  
Lead.....11-64 in. 11-64 in. full

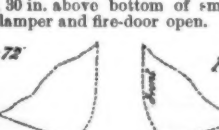


Fig. 72—Boiler pressure, 140 lbs.; revolutions, 100 per minute; 3d notch; throttled; water, full glass; vacuum, 1 1/2 in.; blast pressure, 2 1/2 in.  
Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.

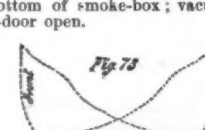


Fig. 73—Boiler pressure, 143 lbs.; revolutions, 128 per minute; 2d notch; throttled; water, 1/2 glass; vacuum, 1 1/2 in.; blast pressure, 2 1/2 in.  
Front. Back.  
Cut-off.....6 1/2 in. 6 1/2 in.  
Lead.....1/4 in. full 15-64 in.









Fig. 74—Boiler pressure, 143 lbs.; revolutions, 140 per minute; 3d notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 1  $\frac{1}{2}$  in.; blast pressure, 2  $\frac{1}{2}$  in. Front. Back. Cut-off..... 6  $\frac{1}{2}$  in. 8  $\frac{1}{2}$  in. Lead.....  $\frac{1}{2}$  in. full 15-64 in.



Fig. 75—Boiler pressure, 127 lbs.; revolutions, 104 per minute; 3d notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 2 in.; blast pressure, 2  $\frac{1}{2}$  in. Front. Back. Cut-off..... 8  $\frac{1}{2}$  in. 9  $\frac{1}{2}$  in. Lead.....  $\frac{1}{2}$  in. full 7-32 in.



Fig. 76—Boiler pressure, 127 lbs.; revolutions, 120 per minute; 3d notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 2 in.; blast pressure, 2  $\frac{1}{2}$  in. Front. Back. Cut-off..... 8  $\frac{1}{2}$  in. 9  $\frac{1}{2}$  in. Lead.....  $\frac{1}{2}$  in. full 7-32 in.



Fig. 77—Boiler pressure, 140 lbs.; revolutions, 60 per minute; 5th notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 1  $\frac{1}{2}$  in.; blast pressure, 2  $\frac{1}{2}$  in. Front. Back. Cut-off..... 10  $\frac{1}{2}$  in. 9  $\frac{1}{2}$  in. Lead..... 7-32 in. full 7-32 in.



Fig. 78—Boiler pressure, 143 lbs.; revolutions, 180 per minute; 4th notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 3  $\frac{1}{2}$  in.; blast pressure, 2  $\frac{1}{2}$  in. Front. Back. Cut-off..... 10  $\frac{1}{2}$  in. 9  $\frac{1}{2}$  in. Lead..... 7-32 in. full 7-32 in.



Fig. 79—Boiler pressure, 143 lbs.; revolutions, 52 per minute; 5th notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 2 in.; blast pressure, 2  $\frac{1}{2}$  in. Front. Back. Cut-off..... 12  $\frac{1}{2}$  in. 12  $\frac{1}{2}$  in. Lead..... 7-32 in. full 7-32 in.



Fig. 80—Boiler pressure, 133 lbs.; revolutions, 112 per minute; 5th notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 3  $\frac{1}{2}$  in. Front. Back. Cut-off..... 12  $\frac{1}{2}$  in. 12  $\frac{1}{2}$  in. Lead..... 7-32 in. full 7-32 in.

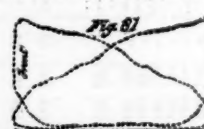


Fig. 81—Boiler pressure, 131 lbs.; revolutions, 144 per minute; 5th notch; not throttled; water,  $\frac{1}{2}$  glass; vacuum, 4 in. Front. Back. Cut-off..... 12  $\frac{1}{2}$  in. 12  $\frac{1}{2}$  in. Lead..... 7-32 in. full 7-32 in.



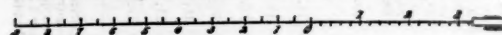
Fig. 82—Boiler pressure, 145 lbs.; revolutions, 76 per minute; 6th notch; throttled; water,  $\frac{1}{2}$  glass; vacuum, 3  $\frac{1}{2}$  in. Front. Back. Cut-off..... 14 5-16 in. 14  $\frac{1}{2}$  in. Lead..... 11-64 in. full 11-64 in.



Fig. 83—Boiler pressure, 143 lbs.; revolutions, 64 per minute; 7th notch; throttled; water,  $\frac{1}{2}$  glass. Front. Back. Cut-off..... 16  $\frac{1}{2}$  in. 16  $\frac{1}{2}$  in. Lead..... 9-64 in. full 5-32 in.

#### Ward's Engineers' Tape.

A Mr. Ward has designed an improved tape, intended especially for engineers in setting slope stakes. One side of the tape measure is laid off in feet and tenths of a foot, in the ordinary way. The other side, however, is laid off for a distance of 9 feet from the end or ring in feet with one mark of subdivision in each foot. The divisions on this side are numbered in the reverse direction from the ordinary way—that is, the numbers begin at the end with 9 and run backwards to 0, as shown in our diagram beneath. The object of this portion of



the tape is to measure off from the centre line the width of the roadbed, say 9 feet for a single-track or 14 feet for a double-track line. From the foot measurement which is marked 0 the tape is laid off in divisions  $1\frac{1}{2}$  feet long, which are each divided into ten subdivisions, as shown in the engraving. These are marked in a different color and style from the other side of the tape, to prevent any confusion of the two in use. In setting slope stakes it is therefore only necessary to lay off from the centre half the width of roadbed, say 9 ft. or less, and then with the  $1\frac{1}{2}$ -foot divisions measure off an additional distance equivalent to the height of fill or depth of cutting, which will give the position of the stake for a slope of  $1\frac{1}{2}$  to 1. The inventor describes the use of this tape as follows:

"The usual method of finding the proper place for a slope stake is to hold the level rod where it is thought the stake should be, and finding how much that point is above or below grade, that height and one-half of that height, and one-half of the width of the road bed are added together, and that distance measured from the centre stake to the point where the rod is held, and if it is found to agree the proper place has been found—if not, it is necessary to try again until they agree. For instance, if there is an 18 ft. road-bed and 4.3 ft. cutting, it is necessary to add  $4.3+2.15+9.0=15.45$ , and measure that distance, but in using the 'engineer's tape' the point marked 4.3 will indicate the required distance without calculation, thus not only saving time but liability to error.

"Where much cross-sectioning is to be done, the operation can be much facilitated by using this tape in connection with a Locke or hand level and a self-reading rod with the zero at the same distance above the bottom of the rod that your eye is above the bottom of your foot, the divisions on the rod running from zero both upwards and downwards. Then, knowing the centre cuts and fills from the location levels, you stand at the centre stake and read off from the rod the additional cut or

fill, which you add in your head to the known centre cut or fill, thus finding the side cut or fill without making a figure. This is immediately compared with the corresponding figure on the tape, to see if you are the right distance out from the centre. Two or three miles a day can be cross-sectioned in this way." Messrs. Keuffel & Esser, of No. 119 Fulton street, New York, are agents for the sale of this tape.

#### Contributions.

##### General Office Accounts—The Payment of Audited Bills.

(From a forthcoming work entitled "Railway Revenue and its Collection," soon to be published.)

(Copyright, 1877, by the Railroad Gazette.)

For each and every claim due by a company, except claims for wages and on account of joint traffic, a separate voucher should be made. It should specify the name and residence of payee; it should give the date and amount; it should recite with minute particularity the nature and extent of the account.

The account or accounts to which the voucher is chargeable should in all cases be stated.

Vouchers for material should give the items in detail, the prices for each being specified.

Vouchers for labor should contain a statement of the time worked, the rate, month and date.

Vouchers for expenses should give each item, date and place. All vouchers for material, oil and other supplies purchased should be vouched for by the officer making the purchase, but it should also be the duty of the treasury department to see that such vouchers are made in accordance with the receipted invoices of its subordinates, the storekeepers and supply clerks; it should further be the duty of the treasury department to see that all vouchers for fuel, ties, building, fencing and track material are made in accordance with the inspection reports of subordinates acting under its instructions and responsible to it; having in the foregoing manner satisfied himself of the accuracy and authenticity of the account or voucher, the accounting officer should attach his certificate to the same.\*

As a rule, no payments should be made except upon accounts duly approved and audited; it may, indeed, sometimes transpire that the imperative nature of the claim renders it impossible as well as inexpedient to await the regular auditing of the account. Occurrences of this kind are, however, exceedingly rare. When they do occur, the payment or the authorization of the payment should proceed, as in all other cases, directly from the treasury department.

The practice of making vouchers for all payments made by or through a railway company is not always followed as rigidly as it should be. This is noticeably so in those cases where a claim is payable by one company but is due by some other line: in such cases it is sometimes the practice of the department having in charge the adjustment of the claim to collect the amount of the company from which it is due and then pay the amount directly to the payee without making a voucher and systematically passing the same through the books. The practice has, doubtless, the merit of directness and simplicity, but is otherwise objectionable for obvious reasons. The paying of the amount, in such cases, in good faith, to the claimant is a matter that would rest very largely, if not entirely, in the discretion of the claim agent or person receiving the money from the company owing it: the transaction would not be recorded or known in the treasury department or upon the general books. In cases like the one recited a voucher should be made and regularly audited in favor of the payee; the amount of this voucher should be charged to the company responsible for the claim, and when such company makes payment the amount should be placed to its credit on the cash book. Under this plan at least two responsible officers are necessarily conversant with the facts connected with each and every transaction; the accounts and receipts are matters of record, are concentrated in one department where the general accounts are kept, and can be investigated and verified at any subsequent time if necessary.

Many railway companies possessing elaborate and skillfully organized accounts do not take the receipt for the payment of the account upon the original voucher, but prepare a copy which the payee signs.

##### THE COURSE THROUGH WHICH AUDITED BILLS PASS BEFORE PAYMENT.

The original voucher is or should be made by the officer of the department in which the debt was incurred.

The voucher should be certified by the subordinate familiar with the facts, and should be vouched for by the department officer; he should attach to it such papers and correspondence as belong to it or are necessary to explain the authenticity and reasonableness of the claim. The voucher should then go to the Auditor, and should be entered and signed by him. Afterwards it should be approved by the officer or officers delegated to perform that duty. The voucher is now complete; it gives all the facts and carries along with it all the collateral evidence of its authenticity; that is attainable. This is the voucher the payee should receipt.

##### PAYMENT ON DUPLICATE VOUCHERS.

To copy it is to increase tenfold the danger of payments being made upon erroneous or fraudulent vouchers.

Why pay money upon the word of one or two subordinate officers upon what purports to be the copy of an account, when

\* The object to be sought after is to make the auditing of accounts entirely impersonal; to make the concurrence of two officers, each being equally conversant with the facts and independent of each other, necessary to the payment of any moneys for the supplies required by a railroad. Few, if any, of our railway companies insist upon so comprehensive a system for auditing their disbursements; it does not, however, follow as a consequence that improper or corrupt practices are matters of common occurrence in the purchasing of railway supplies; on the contrary, the undesired high character of our railway officers precludes any such unjust supposition. The opportunity exists, however, all the same.

the production of the original is so easy and so much more conclusive?

Why multiply the possibilities of clerical errors, and thus incur the risk of accepting a worthless receipt?

The disbursement of funds, except upon the original voucher, would seem to be clearly a mistake.

The idea originated, doubtless, with some isolated and aspiring accountant, whose thirst for original matter, coupled with a desire to make his usefulness apparent, led him to retain in his office what clearly belongs to the treasury.

It is a part of the penalty some of our railway companies pay for the luxury of a book-keeping or abstract department.

When copies are used by the treasury in settling claims, the original voucher is usually filed away somewhere by somebody as evidence that the copy made by somebody is a copy.

The privilege of making this copy is supposed to greatly aggrandize the person making it.

It makes the machine more complicated, and entails additional work.

The grand seigniors who vouch for the copy become quite important if not indispensable to the company.

We rarely if ever find the system described in vogue except when the accounts are separated from the treasury. Then the accountant under cover of enforcing salutary checks upon the Treasurer really usurps his prerogatives and performs his duties.

The peculiar state of affairs we have attempted to describe has arisen out of the attempt to create a book-keeping or abstract department, pure and simple.

The necessity for such a department being purely fictitious, its chief naturally seeks to give a semblance of vitality and usefulness to it which shall outwardly rob it of its artificial and consumptive character.

Accordingly we hear him descanting glibly about the danger of entrusting original vouchers to the Treasurer lest they be lost, and that he requires the originals to perfect his system of checks and balances.

This absurd notion is assiduously cultivated and is accepted upon many lines without question.

The expense of copying the original voucher, the danger of fraudulent practices arising in consequence of it, the risk of clerical errors it entails, the other objectionable features in connection with it, all are alike unnecessary.

##### ORIGINAL VOUCHERS SHOULD BE RETAINED IN THE TREASURY DEPARTMENT.

The original voucher should be filed with the Local Treasurer. It should be his authority for making payment.

To prevent loss and the consequent necessity for duplication it should never leave his department after its payment.

The voucher should be charged up on the cash-book on the day the cash is drawn from the treasury to pay it.

The voucher should be signed by the payee, and when signed or charged on the cash-book should be cancelled by being properly stamped.

##### PAYMENTS OF BILLS TO PARTIES DISTANT FROM THE LINE OF THE ROAD.

When it is necessary to pay a voucher at some point off from the road, the original should not be sent to be receipted, but a copy or receipt should accompany the draft, the receipt to be attached to the original bill upon its return.

A blank similar to the form of receipt attached may be used.\*

The use of a blank of this kind involves the least amount of labor that is perhaps possible.

A separate impression-book should be used for copying such receipts; the book should be indexed. Upon the return of the receipt, properly signed, the copy as taken in the impression-book should be cancelled; the uncanceled copies would then indicate the unsigned receipts outstanding.

This plan affords a very simple and economical means of keeping track of all vouchers that have been paid and charged upon the cash-book, but for which the treasury is unable for the moment to produce receipts.

No voucher should be paid through the mails or otherwise at points off from the line except by the check of the company or by bank draft.

##### VALUE OF PAYMENT THROUGH CHECK OR DRAFT.

The indorsement upon the back of a check or draft and upon which payment has been made by the bank is the most conclusive evidence that can be produced that the receipt attached to the voucher is bona fide in its character.

For this reason a careful and discreet official will, whenever he can, prefer to pay all vouchers and accounts with a check or draft rather than with currency.

When a duplicate check is issued a bond of indemnity for twice the amount should be exacted, the sureties being of the same character as those required upon the bonds of station agents.

##### METHOD OF PAYMENT THROUGH STATION AGENTS.

Great expedition and economy of labor can sometimes be secured by sending the petty vouchers to station agents of the company to pay.

Care should, however, be exercised not to send a bill or account so great in amount that it cannot be paid by the agent from the receipts of the station for one day, otherwise the daily remittances of the agent would necessarily have to be discontinued until the bill was paid, and the Local Treasurer would thus lose the easy and perfect direction that is necessary to enable him to exercise his office efficiently, and for the same reason, no bill should ever be sent to an agent to pay except it is sent by the Local Treasurer.

In forwarding bills to agents to pay, an impression copy should be taken of the letter of advice accompanying the same, in a book used expressly for the purpose.

This printed letter of advice to the agent, directing him to pay the vouchers should read somewhat as follows:

1st. You will at once please pay vouchers described below

\* Form 75, Appendix.



and enclosed herewith, and forthwith return same to this office by express, duly receipted and accompanied by a remittance notice and receipt, when the amount will be placed to the credit of your account on the cash book as a special remittance.

2d. As fast as the vouchers are paid, remit same. Do not hold them until all that are sent you are paid.

3d. If necessary to secure the prompt payment of vouchers you will send notice through the post-office or otherwise, as may be best.

4th. After paying a voucher you will stamp it, on the same date, with your station stamp, directly underneath the filing.

The letter in question should give the number of the voucher, the name of the payee and the amount. The copy book should be indexed. When the bill is returned the entry in the copy book should be checked; in this way it is easy to keep track of the bills sent from the office of the Local Treasurer.

#### SETTLEMENT OF BILLS IN FAVOR OF RAILWAY COMPANIES.

As already suggested, vouchers in favor of another or foreign railway company should be transferred on the journal and placed to the credit of such company upon the railway ledger as a set-off against any possible charges there may be against the said company. In settling balances due railway companies and others, where book accounts are kept, as described, the payee should be required to make draft for the balance. His draft is the receipt of the company making the payment. As a rule the draft is presented by the banks or express companies, and bears other and conclusive evidence of its authenticity.

#### SPECIAL ACCOUNTS AGAINST VARIOUS PERSONS.

Upon every railway, accounts are continually arising against parties for objects foreign to the legitimate purposes of a strictly transportation business.

And as our railway companies are organized to do a transportation business, pure and simple, it follows that losses occur in connection with the class of accounts referred to more frequently, perhaps, than they do with merchants doing a corresponding amount of business.

A railway company should have no book accounts against parties as such accounts are understood in commercial life.

The regulation and control of all accounts of the kind referred to should be one of the duties of the Local Treasurer.

The rules regulating the collection of accounts due to a company from "Various Persons" for old or new material sold or for labor performed by operatives of a company are quite fully defined in the volume on RAILWAY DISBURSEMENTS.\*

If the directions contained therein are faithfully adhered to, it is believed that a company need rarely if ever suffer losses, the fundamental rule being the collection of the cash upon the delivery of the goods or the performance of the work.

\* Chapter XI., pp. 94, 95, 98-102.

#### A Railway League.

WABASH, Ind., July 25, 1877.

#### TO THE EDITOR OF THE RAILROAD GAZETTE:

Many methods for the regulation of existing difficulties will be proposed, in addition to which I would suggest the establishment of a "Railway League," whose legislative body shall be a congress of representatives of the league lines, with advisory delegates from the boards of trade of our commercial centres.

From the deliberations and enactments of such a body would probably result many benefits, among which we may reasonably anticipate the following, viz.: the absorption of all independent line companies; the establishment of rates from all competing points to the seaboard, generally based on some fixed standard (Query, Chicago?) and adequate penalties for their non-observance; the positive statistical determination of the value of railway investment and the cost of transportation and renewals, and their proper application to the determination of rates; the equalization of local rates, as nearly as the varying conditions of transportation will admit; the regulation of the wages of employees, which should bear some fixed relation to the standard and value of transportation; the cessation of the violent conflicts between producer and carrier, by the dissemination of accurate information and the regulation of commercial values dependent on transportation. By thus nationalizing our railway system, without sacrificing the individuality of the lines, our common interests would evolve a common practice and general security. Justice to railway capital once re-established, the general prosperity of all business will be assured, and skilled railway labor will naturally command adequate reward.

OWEN RICE.

#### Lightning Striking Railroad Trains.

#### TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of June 29 there is an extract from "Spang's Practical Treatise on Lightning Protection" that is so directly opposite to all we see and hear of the subject that one cannot but think there must be a mistake somewhere. In regard to the boiler explosion, it has been held up to those good people who believe in special manifestations of divine wrath as an example in point. The engineer is said to have made a threat that he would make the trip with that train, a very heavy one, or take his "breakfast in hell." As a punishment he was allowed to do so—evidently unjust, as it necessitated injury to innocent parties.

In reading the extract it seems to me, however, that cast-iron crown bars and thin plates in the boiler might have arranged this matter very well, without the theological or scientific reasons.

If Mr. Spang's ideas are correct, we are in constant danger, as within my personal knowledge lightning rods have been attached to water and gas mains. In many cities the telegraph operators do this with their ground wires: as yet we have no instance of any damage.

On Monday, July 9, 1877, at Elizabeth, N. J., "a locomotive in the depot of the Pennsylvania Railroad was struck by a bolt that passed from the wire above with a loud crackling sound.

The engine did not budge, and the disgusted lightning leaped off and passed into the ground."

It is common for vessels to be struck, but seldom do we hear of damage, as the wire rigging or other arrangements carry it off to the large deck beams or bolts or other masses of iron.

The fact is that almost any large mass of iron can absorb and retain any quantity of celestial electricity that can reach it. Sir W. Snow Harris has a plan of conducting electricity to deck beams and other masses of iron. See Knight's Mechanical Dictionary, page 1,317.

The idea that the water in a boiler could receive such an accession of heat from it, in an instant, is simply absurd, especially in condition of boiler as noted above.

The second paragraph of your extract is somewhat at variance with the first, as it talks of diffusion over iron cars and gives it an "invariable" direction through wooden cars over contents or inmates to reach the earth, advising rods to carry it off through centre plates to pedestals, thence to the earth, expressing a doubt as to condition of the ground in certain circumstances to receive it.

This evidently must be an error or misunderstanding as to the conduct of lightning in presence of large masses of iron, as no well authenticated case is recorded of engine or train or even iron vessel being injured by lightning.

#### The Cone of Driving Wheels.

#### TO THE EDITOR OF THE RAILROAD GAZETTE:

In your reply to a correspondent who makes an inquiry as to the proper "level" to be given to the tires of driving wheels, you give it as your opinion that the coning of wheels "is of not much practical importance." You base your opinion on the fact that the cone of new wheels soon wears off. I think this fact should hardly be accepted as proof that there is no advantage gained in coning wheels.

If you take a perfect cone, say 6 in. in height and 6 in. in diameter at its base, and lay it on a plane surface and give it motion and let it roll of itself, it will describe a circle, the apex of the cone being the center and the length of the cone the radius of the circle. Take another cone longer than the first and cut off the apex so that it will be half an inch in diameter and roll it as before, and it will describe two circles; that is, when the larger diameter has completed a circle the smaller end of the cone will have run round a circle one inch in diameter. And if you have other cone-shaped pieces with the diameters of the smaller ends increasing, the circle made by the rolling of them will be correspondingly increased in diameter. The radius of the curves traveled by these cones will increase until the cone assumes the form of a cylinder, when it will travel in a straight line.

Or, to reverse the operation; commence with a cylinder of wood (which would roll in a straight line), and turn it down by degrees, or a little after each roll, until the form of a perfect cone is reached, when the radius of the curve it will travel of itself will have been reduced from several feet to just the length of the cone. From this it would seem that the driving-wheels of a locomotive would behave better on a curve by being coned.

The fact that the tread of the wheel wears more rapidly near the flange, thus destroying the cone, is due to the position and form of the rails and defects in the track. The pattern of some rails is such that if they are laid flat on the ties, the tread of the wheel bears only on the inner edge of the rail, which wears off only the larger portion of the tire, or wears out the cone. The combined effect of running on the edges of the rails, open joints in the track, steel-plated frogs, sanded rails and slipping of the drivers not only soon wears all the cone, but grooves soon take the place of the "bevel."

Some rails are made with one side lower than the other, so that the tires will have a bearing the whole width of the top of the rail, but it frequently happens that tracklayers get the wrong side of the rails to the flange, and the matter is made worse. More than 20 years ago Capt. P. Jarrett, who was Chief Engineer of a road in Pennsylvania, had the ties grooved the width of the base of the rail, the grooves inclining inward, which gave a bearing of the full width of the top of the rail, and it proved beneficial in preserving the cone of driving-wheels, as well as keeping the rails to a true gauge. If more attention was paid to this matter both the rails and locomotives would be more durable and need less repairs.

As to the proper amount of cone to give a tire, that would depend somewhat upon circumstances. On a road where curves are numerous and of very sharp radius, it would be well to give more cone than on a road of easy curves and mostly straight line. On a curve of 500 feet radius (for instance), if it were laid to a complete circle there would be a difference of about 14 ft. 11 in. (14.8996) in the length of the rails. If the wheels were made cylindrical there must be a slip of that distance—almost an entire revolution of a 5 ft. driving-wheel. This would bring a powerful torsion on the axle and great strain on the parallel rods and crank-pins, and wear the rails and flatten the tires. To remedy this a bevel of 0.4375 inch ( $\frac{7}{16}$  of an inch) would be required. This amount of bevel would be more applicable to yard engines, as road engines would seldom be put to such "circular work." For a curve of 1,000 feet radius 0.2187, or  $\frac{7}{32}$  and  $\frac{1}{2}$  of an inch very nearly, would be about the thing for easy work; but of course the cone cannot be made to fit all curves, and the proper way would be to make allowance for the most severe strain and slip on the road. Among the mountains, where sharp curves are numerous, a greater degree of conicity is advisable than on roads comparatively straight. The rails should be laid to conform to the conicity of wheels, and both the cone of wheels and incline of rails should be made to accommodate the maximum or predominating curvature on the road. Of course the rails should be laid with the same inward incline on easy curves or tangents as on the curves of the shortest radius, or, uniform throughout the entire length of the road. If the rails were laid flat on tangents,

and with slight incline on easy curves, with a greater incline on sharp curves, and the wheels were coned with reference to the sharp curves, the bevel of the wheels would soon be destroyed by running on the easy curves and tangents. And doubtless a moderate degree of cone would be beneficial on straight line, and with the rails properly laid the amount of cone designed especially for the sharp curves would not injure the rails in the least so long as they had a proper bearing. If wheels were made cylindrical, the end thrust from lateral oscillation would be forcible, and a conical wheel would have a tendency to tone down the shocks caused by bad line or kinks in the track. But it would not be well to give the tires of locomotives more cone than the car wheels have, for obvious reasons. Something like uniformity of cone should be aimed at, and engineers of road departments can, by attention to details and consultation with master mechanics, bring track and rolling stock to a far better relation to each other respecting the foregoing subject than is the case at present.

WM. S. HUNTINGTON.

[It is true that a cone if rolled on a flat surface will move in an arc of a circle, but if two cones are attached by their axes to a frame similar to a truck frame, as shown in fig. 1, so that they can turn freely, they will not roll either

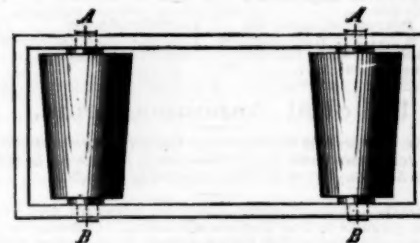


Fig. 1.

in an arc of a circle or a straight line without much difficulty. Now, two or more pairs of wheels of a car truck or an engine are in the condition of the cones represented herewith—that is, their axes are held in a position parallel to each other, and therefore no matter how much or how little the wheels are coned, they will not roll in a curve. If the axes of the cones were inclined towards each other at their small ends, then the pair would roll in a curve. So with coned wheels: if their axes could assume a position radial to the curves, they would when in that position roll easier in a curved path than in a straight line, but so long as they are held parallel to each other probably their conicity does very little good, even if it did not soon wear away.

Neither can we see what good it would do to incline the rails, so long as wheels are subject to the wear they are now, because if a rail is inclined at the proper angle for a new wheel, it would not be right for one which is worn and vice versa. The fact is, the coning of wheels is a favorite theory with many which has been spun so fine that, to use a slang phrase, it is "too thin" for practical use.—EDITOR RAILROAD GAZETTE.]

#### THE SCRAP HEAP.

#### Railroad Manufactures.

The Schenectady (N. Y.) Locomotive Works have an order for five engines for the Chicago, Milwaukee & St. Paul road.

The Pottstown (Pa.) Iron Works have now all the departments of the works in full operation.

Port Oram Furnace, in Morris County, N. J., has gone out of blast for repairs, but will start up again as soon as repaired.

Stewart & Co.'s rolling mill, at South Easton, Pa., has started up again, after a short stoppage.

The Hinkley Locomotive Works at Boston are narrowing some locomotives from 5 ft. 6 in. to standard gauge for the European & North American Railway. They are also completing some locomotives of 2 ft. gauge for the Billerica & Bedford Railroad.

The Delaware Bridge Co. recently completed a bridge over the Des Moines River at Des Moines, Ia., for the Keokuk & Des Moines Railroad.

The Barney & Smith Manufacturing Co., at Dayton, O., besides a large order for the Cincinnati Southern, has orders for a number of oil cars for the Standard Oil Co., a lot of Tiffany and Zimmerman refrigerator cars and several narrow-gauge cars.

Black, Daker & Co., of Pittsburgh, have bought the Wells-ville Rolling Mill and will run it on steel.

The Belfont Iron Works, near Ironton, O., paid dividends amounting to 8 per cent. last year.

The Roane Iron Co., at Chattanooga, Tenn., is about to add a steel mill to its works. The new mill will be a brick building 80 by 120 feet, and will have two Siemens-Martin furnaces, rail and bar rolling mills and the necessary engines to furnish power. The company has begun to mine, at Cartersville, Ga., a gray specular ore, which is expected to make iron well suited for conversion into steel.

A company, known as the Hamilton Iron Co., has been organized to build a new blast furnace at Chattanooga, Tenn.

The Star Manufacturing Co., of Halifax, N. S., recently completed an iron bridge of 150 feet span over Elmsdale River on the Intercolonial Railway. It replaces an old wooden bridge, and was finally tested and accepted last week. It is the first iron bridge built by a Nova Scotia shop, and cost about \$10,000.

The Portland Co., at Portland, Me., has just delivered three engines to the Western Counties Railway, of Nova Scotia, and is building several engines for the Quebec, Montreal, Ottawa & Occidental Railway, and 35 cars for the Burlington & Lamoille Railroad.

#### Steam Street Cars.

The Hill street & West Dubuque street road was recently opened for traffic. It is a semi-suburban line in Dubuque, Ia., and is operated with the separate street engines built by the Baldwin Locomotive Works, which are reported as working very successfully. The road has one short grade of 9% feet in 100, up which 125 passengers were taken at one time on the day the road was opened.

A Baldwin engine is now running regularly on the Newark & Bloomfield street road, at Newark, N. J., and more are to be put on the road. One was also delivered last week to the Newark & Irvington road and is now in use.





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## Editorial Announcements.

**Passes.**—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

**Addresses.**—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

## AFTER THE BATTLE.

At the time we are writing the influence of the strikes produces only a faint ripple of disturbance on the daily papers. The news comes from every part of the country that trains are again moving, and business is resumed on lines which have been closed by the strikes. The question of paying the costs now seems to be in order, and is not a pleasant one to contemplate. Probably there are many people who think that now that the military are disbanded, and that business has returned to its ordinary channels, all further trouble from the labor question is at an end; that the condition of things is as though the strike had never occurred, and that its causes have been annihilated. If this were true there would be little use in discussing the subject any further, but the fact is, that the causes which produced the strike exist to-day, and will continue to exist unless the whole constitution of society is changed. The fact that "it takes two to make a bargain" will always make a condition of things possible in which the money offered for labor may be less than the men may be willing to work for. A refusal of the latter to work for the pay offered is a strike, but an effort to forcibly prevent others from working is a riot. This distinction, unfortunately, is often not recognized by workingmen with sufficient clearness to prevent them from doing unlawful acts, and thus placing themselves in a position altogether wrong, and alienating from the support of their cause those who would be their truest friends. It is for this reason that it is often so difficult for those who are disposed to do so to defend the working men's side in disputes about wages. Probably few of the members of trades unions know how many warm and disinterested friends their cause loses, and how many earnest and honest people feel obliged to withhold all active support from such associations, owing to the means which are often employed to aid that side. In discussing this subject with a gentleman, who began life as a mechanic but who has since achieved distinction as an artist, and who has been a close observer of the labor question, he remarked that when a person of education and influence undertook in an honest and unselfish way to aid the workingmen, the feeling of utter helplessness to do anything for them on account of their lack of wisdom and self-restraint

usually either drives him into a state of the most reserved and perhaps selfish social exclusiveness, or else breaks his heart. There are persons, whether the members of the trades unions know it or not, who contemplate the labor question, as it is called, with inexpressible sadness, because the acts of those who pretend to be the friends of the workingmen make their real friends helpless to do or say what they know might otherwise be done or said for them.

There are, however, some indications that the men begin to see that all criminal and lawless acts perpetrated during a strike are an injury to their cause and detrimental to their interests. In a letter written by Mr. Arthur, Chief of the Brotherhood of Locomotive Engineers, just published in the New York Herald, he says: "With the exception of the Erie road, the railroad men now engaged in the strike were justified in refusing to work under the last reduction and in persuading and hiring others not to take their places. Beyond that they had no right to go, no matter how much they felt aggrieved; and all those who have resorted to violence have forfeited all claim to public sympathy and are looked upon and treated as outlaws." Now if Mr. Arthur will only inculcate this principle more generally, if he will make it one of the established doctrines of the organization of which he is the chief, if he will present it to the members and enforce it in every way he can, he will be doing their cause and the whole community a benefit, and he will be advancing the labor question to a position where it will merit and receive the consideration which it deserves. The position which all trades unions occupy with reference to these principles, which Mr. Arthur has presented so forcibly, is the one that lays them open to suspicion, and they cannot speak too plainly about it.

There is probably some ground for the complaint which Mr. Arthur made in an earlier letter, also published in the daily papers, addressed to Mr. Scott, President of the Pennsylvania Railroad, in which the writer says:

"The great trouble with some of the railway officials is the love of having their own way, regardless of the discomfort and inconvenience it causes others. Instead of endeavoring to cultivate a friendly feeling between themselves and their employees, they repel them by their haughty, overbearing and arbitrary conduct, and arouse a feeling of hostility, of which the recent outbreaks are the fruits."

There is no doubt much truth in this in some cases, and that the arbitrary conduct of railroad officers to their employees should arouse a state of indignation in the latter is not unnatural, and if some of the former improved their manners, it is probable that some of their difficulties and misunderstandings now very expensive to the railroad companies would be avoided.

There is, however, a delusion very prevalent among railroad officers and the community generally which perhaps stands in the way of the amicable adjustment of disputes between workingmen and their employers as much or more than anything else. That is, the idea that somehow a strike is an abnormal condition of things, somewhat like a pestilence or an invasion of potato bugs, and that if we could only employ sufficiently destructive means to kill the bugs, or, by applying some adequate social sanitary measures, either clear out or disinfect the putrescent cause of the pestilence, we would always be free from the evil. We have repeatedly called attention to this error, and that we are not alone in this view, but that there is eminent authority to support it, the following extract from Professor Fawcett's "Manual of Political Economy" will show. After discussing the subject, he says:

"Strikes are inseparably associated with our present economic system. As long as the relations between employers and employed continue to be analogous to those existing between the buyer and seller of a commodity, it must often happen that the one party will refuse to accept the price which is offered by the other for labor; if the refusal is persisted in, a strike inevitably ensues. When strikes are regarded from this point of view it is as hopeless to expect that legislation can prevent them as it is to suppose that merchants could be compelled to sell their goods if an inadequate price were offered for them. Something may no doubt be done by conciliation and arbitration, either to obviate or to render less frequent the trade disputes arising between employers and employed. A master who exhibits great personal interest in his workmen's welfare is generally able amicably to settle any difference which arises in his business upon a question of wages. Experience has also shown that the establishment of courts of arbitration often enables trade disputes to be arranged without recourse being had to the disastrous expedient of a strike. The efficiency of these courts depends to a great extent upon making a wise selection when choosing an umpire. It is usual for the employers and employed to have an equal number of representatives in these courts of arbitration. The ultimate decision has therefore sometimes to be made by the umpire or referee, who must be a person absolutely unsuspected of any bias towards either party in the dispute."

"Such expedients as personal conciliation and courts of arbitration, although exerting a most useful influence, do not provide a completely efficient remedy for strikes. These disputes must be regarded as the natural outgrowth of the existing relations between employers and employed."

Now, this being the case, a strike may occur at any time. Railroad companies are no more freed from them because the soldiers and policemen have subdued the rioters than the people are from the danger of fire because the last one has been extinguished. It is true that rioting and lawlessness are less liable to occur if any outbreak of that kind is suppressed and the guilty ones punished, but

\*The italics are ours.

that will not prevent large numbers of men from agreeing not to work for the wages which are offered. The men have a perfect right to do so, and that is a strike. So long as it takes two to make a bargain, a strike may occur. It therefore seems that, in view of this fact, it would be much wiser to adopt such measures as experience has shown will "often enable trade disputes to be arranged without recourse being had to the disastrous expedient of a strike."

Railroad officers often seem to regard combinations of men for maintaining or increasing their wages as hostile and unlawful organizations. Instead of this being the case, the men have as clear a right to combine for that purpose as a number of manufacturers have to regulate the sale of their goods or products.

But it will be said that the law of supply and demand will determine the price of wages, which is true in a very broad sense and if a sufficient time is allowed to elapse for that law to have its full effect; but, to quote again from Professor Fawcett's excellent chapter on "Trades Unions and Strikes":

"Although it is no doubt true, that the price at which a commodity is sold approximates to the cost at which it can be produced and brought to market, yet the price at which it is actually sold is often to a considerable extent influenced by various circumstances which may happen to place the buyer in either a better or worse position for bargaining than the seller. In a similar way wages ultimately depend upon the amount of capital and upon the number of laborers; yet the wages which, at any time, are paid in a certain trade are to a considerable extent influenced by the relative advantages possessed by employers and employed for carrying on the bargaining by which wages are adjusted."

The bargaining which often goes on in adjusting wages implies a struggle, or a conflict of effort between employers and employed; in this conflict a great advantage will be possessed by those who can act in concert over those who simply act as isolated individuals."

If, as the result of the "great strike," it should occur that the workingmen should recognize clearly and distinctly, and should in effect say, to railroad officers: We have a right to combine to maintain wages, and we will exercise that right, but we have no right to prevent others from working or to injure or destroy property, and, as far as is possible, we will discountenance and prevent all such acts; and if, on the other hand, railroad officers should recognize that employees have such a right, and should treat them accordingly, and each party should recognize the evil which it is in the power of the one to inflict upon the other by a strike—if with such convictions they should discuss the questions in dispute with each other in a fair and honest way, we believe that it would do much to mitigate if it would not wholly prevent the evil of strikes.

## Railroad Profits and the Reductions in Railroad Wages.

In commenting last week on the relation between the rate of wages on railroads and the profits on the capital invested, we took some pains to show that there is not always necessarily a connection between them: that is, the wages may be reduced while the enterprise continues profitable, and, on the other hand, the profits may disappear entirely while yet it may be impossible to make any reduction in wages. It is true, however, that if a given business is prosperous while business generally is not, the proprietors of the profitable business will not be so prompt to reduce wages as employers whose profits are decreasing. Sooner or later, however, the wages in the business which is exceptionally prosperous will be forced down to or near to the common level for workmen of similar skill and experience, because of the flocking of men to the exceptionally profitable employment. Doubtless, however, the employers whose business suffers most have the greatest inducement to reduce wages, and will reduce them most if they can, and they may be led to attempt reductions which are greater than are warranted by the condition of the general labor market, when they are likely to fail.

In presenting some of the changes that have occurred in the profits of railroad companies since the period of general prosperity, therefore, we by no means intend to suggest that the decrease in these profits of themselves warrant reductions in wages. It is perhaps true that they do so more than the changes in the profits in any other business, for the reason that railroad business to a greater extent than almost any other one industry reflects the general condition of business in the country, and the general condition of business has a great deal to do—has almost everything to do—with the proper, the necessary rate of wages. Still it is quite possible to so overdo the business of transportation as to destroy its profitability even when general business is good; and we have no hesitation in saying that railroad business in this country has been overdone more than almost any other.

However, as some of the strikers have given as one of the grounds of their movement the maintenance of high dividends by some of the employing companies, it is well to consider to what extent railroad proprietors have suffered before making the recent reduction in the wages of their employees.

It ought not to be necessary to say that no rational conclusion can be drawn from the case of one or two or even



half-a-dozen companies. No one ought to expect the Boston & Albany to pay three dollars a day for a class of employees to whom no one else pays more than two dollars. And because the Chicago, Burlington & Quincy, the Chicago & Alton and the New York Central & Hudson River have continued to pay as high dividends as in the prosperous years before 1873, we may not conclude that "railroad business" is profitable, and that reductions in railroad wages are not needed by railroad proprietors. Indeed, a comparison of the dividends of all the roads would give a very inadequate idea of the actual changes in railroad earnings. As we have endeavored to show heretofore, there has not been after all so very great a change in the returns of the railroads which paid dividends regularly previous to 1873, except in the case of the anthracite coal roads. They were always a small portion of the whole number, and by far the largest part of the net earnings of American railroads, in prosperous times as well as now, has gone to pay interest on their debts. The great calamity to stockholders as well as bondholders has been the inability of a very large proportion of these non-dividend paying roads to earn the interest on their bonds. It has not reduced the income of the stockholders on their investment, it is true, because they never had any; but it has destroyed the principal—the stock formerly having had a value because of the prospect that it would sooner or later receive dividends.

There have been about \$800,000,000 of bonds which have ceased to receive interest—and all this in addition to the reductions in the rates of dividend, which are likely to be more numerous this year than heretofore.

Below we give the reported surplus net profits of a number of the more important railroads for the years 1873 and 1876, taken from Poor's Manual. The figures are intended to cover that part of the net earnings which accrue to the companies—the stockholders—whether divided or not, and are found by subtracting from the net earnings (gross receipts less working expenses) all the fixed charges, consisting almost exclusively in interest on debts and rentals of leased lines. In many cases this includes profits expended in construction, which is, of course, an addition to the property of the stockholders, and consequently a part of his profit:

Surplus Net Profits of Leading Railroad Companies in 1873 and 1876.

1876.	1873.	1876.	1873.
\$1,971,400	\$2,050,200	\$72,000	\$210,000
2,214,300	1,976,900	189,000	540,000
283,285	362,100	198,000	143,000
406,800	478,600	85,000	85,000
*1,230,000	3,840,000	210,000	186,000
7,212,000	7,624,100	*565,000	*55,000
92,000	301,000	1,236,000	1,390,000
71,700	177,000	3,083,000	3,293,000
70,700	140,000	2,896,000	2,419,000
*1,362,000	4,133,800	*371,000	*280,500
*537,000	509,000	*347,000	230,000
*332,000	651,000	*327,000	*15,000
585,000	530,500	*124,000	210,000
63,000	183,000	1,068,000	611,500
92,300	350,400	1,027,000	2,302,000
308,000	2,020,000	*497,000	*334,000
143,400	274,000	1,180,000	2,240,000
897,000	1,445,000	49,800	161,500
1,629,000	2,180,000	1,614,000	3,013,000
288,500	539,000	*1,250,000	*195,000
698,000	629,000	*43,500	283,400
		*208,500	*10,000

\*Deficit.

This list was made hastily, the principle of selection being the importance of the lines and the facility of ascertaining their profits, no line being omitted in any case because it may have chanced to show increased profits, and most of the important railroads being included. Moreover, no account is taken of any increase in stock capital, whether representing additions to the property or not.

The aggregate of the profits of these lines accruing to the stockholders was \$46,327,000 in 1873, and but \$22,580,000 in 1876, the reduction thus being more than one half. Certainly, in the face of such a decrease in their incomes, it was to be expected that the proprietors of railroads should make every effort possible to reduce the expenses of their business. Some of these efforts may be unavailing, and stockholders cannot expect their employees to take a cent less than the market rate because profits have fallen off. They are, however, justified in endeavoring to find what the lowest market rate is.

#### The Crop Prospects.

The crop prospects are such as to justify the expectation of a heavy fall and winter traffic. The winter wheat is now gathered and is almost everywhere reported excellent, the aggregate crop being probably as large as any ever harvested in America. Winter wheat is mostly consumed in this country, but when the crop is abundant just so much more spring wheat is set free for exportation. The chief production is in Ohio, Indiana, Central and Southern Illinois and Missouri. The considerable quantities raised further east are chiefly consumed near home, and do not afford any considerable traffic. The harvest of spring grains has but just begun in the Northwest, and, in spite of dangers threatened recently by excessive rains, is now expected to be very large. Spring wheat is the chief crop of Wisconsin, Minnesota and Northern Iowa, which last year had a very poor crop; resulting in a great decrease in the earnings of the railroads in that territory, which is especially

observable in the returns of the Chicago, Milwaukee & St. Paul, the Chicago & Northwestern, and the Iowa lines of the Illinois Central. With the current prices for this grain, and the crop which it is now reasonable to expect if the harvest is gathered without calamity, the business of these lines is likely to be enormously improved, and that very soon, as wheat is the first grain to come forward, the new grain beginning to reach market in August, and in great quantities in September and after, the activity of the demand having much to do with the earliness of the movement. In 1873 the grain movement began unusually early and was exceptionally heavy, there being an enormous crop and a great demand for money in this country and great demand for grain at high prices abroad. No doubt this great and very profitable grain traffic coming at the very height of the financial collapse did much to mitigate the effects of that calamity, and a similar traffic this season may do much towards the final recovery. As to the probable maintenance of prices, the condition of the grain market is the best clue. There appears to be a fair crop in France, an inferior one in Austria-Hungary, a satisfactory one in South Russia, and the prospect of a light one in Great Britain; but the war is almost sure to hinder the free movement of the Russian crop (the chief one exported), and this and the possibility of its extension to other European nations has tended to keep prices firm, a tendency strengthened by the great falling-off in the crop of California, which will probably have some 10,000,000 bushels less to export than last year. The importance of the Pacific coast as a competitor for the supply of the European markets is not generally appreciated. During the first half of this year, nearly one-third of the total supply of Great Britain came from this Pacific coast, and the quantity from that source was 2½ times as great as from the Atlantic coast of the United States, and 1½ times the Russian exports to Great Britain. No two other countries supplied as much as the Pacific slope of the United States alone.

The great grain crop of this country, however, equal in value to several times the value of the best wheat crop, is Indian corn. This was at one time said to be suffering from excessive rains; but corn is the hardest of our grains, and the crop hardly ever fails unless it is prevented from ripening by early September frosts. Anxiety on its account seems now to have ceased, and though it is too long before the ripening of the grain to be at all certain of the result, the area planted and the present condition of the crop give promise of one of our most plentiful crops. Corn during the past year has been the chief grain export of the Atlantic ports. The quantity exported, however, is but an insignificant fraction of the whole crop, most of which never leaves the farm in the form of grain. Usually corn is exported only when it is cheap, the foreign demand falling off almost entirely when the price advances considerably. The use of the grain as a food for animals, especially for work horses, is now pretty thoroughly established in England, however, and Great Britain took about 32,000,000 bushels in the first half of this year and of 1876 as well, against 19,000,000 in the first half of 1875. The chief European source of supply is the valley of the Danube and especially Roumania, and the military operations there this season are likely to lessen its competition. The corn crop of 1877, however, will hardly begin to move in any quantity (except in the form of fat hogs) before next January. If the crop is abundant, however, doubtless the reserve stock of old corn will go forward freely in the fall, and this with the small grains may make the roads very busy at remunerative rates, and as the prospect of good crops is general the good effect is likely to be shared by all the roads which depend largely upon the grain traffic for their support.

The cotton crop has about a month more to grow before picking is generally begun, but during the three or four months of picking it is liable to some dangers, and during the remaining month of its growth there may be an almost complete reversal of the present prospect, which promises a good crop.

The hay crop is good, forage is abundant, the potato crop, our only important root crop, is plentiful, and apparently the earth has done and is doing all that could be expected of it and almost all that could be hoped of it to make the country prosperous.

#### The New Issue of Poor's Manual.\*

Poor's Manual, which was issued for 1877-78 a few weeks ago, must necessarily grow with the growth of our railroad system and with its own completeness. This volume has 60 pages more than the issue of last year,—51 pages of introduction, 960 of railroad reports, besides advertisements. A part of the interesting introduction to the new volume we published and commented on a few weeks ago. The body of the work, of course, is not a book to become entranced with, being solely a work of reference. Moreover, the material is of such a nature that it cannot be criticised very satisfactorily until it has become antiquated and is replaced by a new issue. After about a year's use, one may speak pretty confidently of its

\*Manual of the Railroads of the United States for 1877-78, showing their mileage, stocks, bonds, cost, traffic, earnings, expenses, and organizations: with a sketch of their rise, progress, influence, etc.: by Henry V. Poor. Tenth series. Published by H. V. & H. W. Poor, No. 68 Broadway, New York.

merits and defects, if he has used it as constantly as the book has to be used in this office. But if we cannot positively vouch for the quality of the work in the new volume, we can at least testify that years' of experience with the previous issues has shown that it is generally accurate, and as complete as it is perhaps reasonable to expect a work of this kind in a country where many railroad companies report or not as they please, and report what they please and in such form as suits them best. It would be easy to draw up a form of report which would be much more satisfactory than anything the Manual gives us, and it would certainly be a great improvement if all the reports were given according to one form, so that any given item of information could be readily found, and found for a series of years and for all companies. But as it is quite impossible to get the information to fill up a model form of report, it will hardly be worth while to draw it up as yet.

We have, however, examined the new book sufficiently to see that there is an improvement in the presentation of the accounts, making it easier to get a clear idea of the financial standing of a company, by presenting net earnings and interest charges for successive years, earnings and expenses per mile, etc. This is not a new feature in the Manual, and it is not a general one in this issue, but it is more general than heretofore, and is one which adds materially to its value. It is not always easy—in fact it usually is not easy—to ascertain from a company's accounts what the result of the operations of a year, or of a series of years, has been, though net earnings, funded debt, rate of interest and rate of rentals may be given. This difficulty nearly disappears if in adjacent columns the net earnings, and all the actual fixed charges accruing for the year—interest, rentals, etc., are given for each year. But this is rarely done, even in the last issue of Poor's Manual. Interest is given sometimes, but rentals rarely except for the last year; and this sometimes makes it impossible to know what the actual amount of profit made by the company was, or makes it necessary to make a considerable calculation in order to ascertain this most important fact.

The Manual has certainly been much improved of late years, especially as regards completeness, there being now comparatively few companies which do not have some sort of figures for capital account and yearly operations in it. The work being the only source of information covering all the roads of the country, it is naturally looked to as the authority on the subjects treated, and this makes it important to the companies that all the information concerning themselves which they wish to make known should appear in it, as a vast number of people if they cannot get the information there will never look further for it.

If a little greater pains were taken by the companies, the Manual might be much improved; but it can never be made what it should be until uniform reports are made. Its chief value at present is to facilitate investigations of individual roads; but with greater fullness of details and uniformity in the reports, the results presented now in the introduction for the railroads of the whole country or certain groups of States might be made of almost universal interest and of great value to the country and the railroad companies.

#### Reporting Car Expenses Per Mile Run.

In speaking of the importance of keeping car mileage, we have often urged the value of it as a means of reducing expenses to a simple and uniform unit of work, which would be available for comparison with other periods on the same road, and with other roads (if they reported car mileage also). In speaking of the variety of such car-mileage reports, we have neglected to cite the practice of Mr. Wm. Mahl, Auditor of the Louisville, Cincinnati & Lexington Railroad, who for some time has not only kept and reported car mileage, but has availed himself of the information so gained in reports of car expenses. These reports are made monthly and yearly, and besides the column of figures below (which is headed "This year") there is another to the right in which the figures of the preceding year, or for the corresponding month of that year, or for the preceding month of this year, may be placed for comparison. The following is the form used:

CAR MILEAGE		For the year 1876.		This year.
Miles run by—				
Passenger cars.....				901,668
Baggage and mail.....				341,425
Express.....				89,069
Freight.....				3,613,028
Road.....				606,846
Foreign passenger.....				10,645
" freight.....				740,265
Parlor and sleeping.....				282,840
Total.....				6,488,797
Repairs per Car Mile—				
Passenger.....				2.281
Baggage and mail.....				1.510
Express.....				0.245
Freight.....				0.802
Road.....				0.097
Parlor and sleeping.....				5.402
Superintendence and clerks per car mile.....				0.050
All other maintenance of car expenses per car mile.....				0.023
Per Passenger Equipment Mile—				
Cleaning, oiling and inspection.....				0.266
Oil and waste.....				0.022
Fuel and light.....				0.042
Links and pins.....				0.019
Other train supplies.....				0.019
Galls. oil per 1,000 miles.....				1.049
Lbs. waste " ".....				0.275
Per Freight Equipment Mile—				
Cleaning, oiling and inspection.....				0.051
Oil and waste.....				0.018
Fuel and light.....				0.002
Links and pins.....				0.019
Other train supplies.....				0.022
Galls. oil per 1,000 miles.....				0.782
Lbs. waste " ".....				0.541
Total cost per passenger, baggage, mail and express car mile.....				2.2 3
" freight-car mile.....				1.0 2

There is some significance in a report of this kind, and some comparison is possible when expenses are so expressed. A somewhat similar report of locomotive expenses is made by Mr. Mahl, which we believe we have called attention to before.



### The Internal Commerce Report.

We completed last week the publication of one of the sections of the report of Joseph Nimmo, Jr., Chief of the Bureau of Internal Commerce, which we hope none of our readers interested in the movement of traffic and the establishment of rates on it have failed to read. The great complexity of the problem is made plain by this paper, which is certainly a valuable contribution to the literature of transportation, though but one of a number contained in the report, which covers a field but very lightly touched upon in railroad literature heretofore, English or foreign, and one of the greatest practical importance, to the railroad man, and to the Legislator who has to deal with transportation problems.

It is possible that some of our readers may have been misled by some remarks published two weeks ago in introducing the report as to the nature of the work done by Mr. Nimmo, the Chief of the Bureau and author of the report. Mr. Nimmo collected the material furnished by experts and officers of commercial organizations and prepared the report, which was spoken of as chiefly a compilation from the appendices. This, doubtless, was not the proper word. The report was founded chiefly upon the material contained in the appendices, as a lawyer's argument is founded upon the law and the testimony; but we did not mean that the report was simply an abridgment and a repetition of the statements in the appendix. And indeed if it were, it would by no means follow that the labors of the Chief of the Bureau had been insignificant. It required a special knowledge and a very rare knowledge to select the persons capable of giving the valuable information contained in the appendices, and especially a wide knowledge of the subject and great skill to frame the questions which were given to these gentlemen to answer. If not a word of the report had been written, this would have done credit to the head of the Bureau; but the report itself, as the part published in these columns shows, is a valuable addition to our knowledge of a most important subject. In matters of this kind it often happens that good work is not appreciated by the superiors of the official—the persons reported to—through their ignorance of the whole subject and inability to comprehend its importance. But we believe that railroad men who study transportation questions will duly value material of this kind, however it may be with members of Congress and officers of the administration.

### Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

*Lake Erie, Alliance & Wheeling*.—Extended from Palmyra, O., northward to Braceville, 10 miles. It is of 3 ft. gauge.

*South Pacific Coast*.—Extended from San Jose, Cal., south to Los Gatos, 10 miles. It is of 3 ft. gauge.

This is a total of 20 miles of new railroad, making 751 miles completed in the United States in 1877, against 1,010 miles reported for the corresponding period in 1876, 538 in 1875, 839 in 1874, 1,872 in 1873 and 3,237 in 1872.

THE CONSTRUCTION OF THE ST. LOUIS BRIDGE is the subject of a long memoir in the July number of the official French professional journal, the *Annales des Ponts et Chaussées*. This paper (70 pages long) is by M. Lavoine, who has in the same number another considerable paper on the competition for improving the traction of boats on the New York State canals. M. Lavoine was greatly impressed by the methods used in constructing the St. Louis Bridge, saying: "Whatever may be the final result of the enterprise from a financial point of view, it is none the less one of the greatest works accomplished of recent years by the art of the engineer. This work is no less remarkable by the boldness which governed its conception than by the originality of the processes by which it was executed." And again: "Finally, by the grandeur of its proportions, as well as by the novelty of the methods by aid of which the problems concerning the construction of the foundations and the superstructure were solved, the St. Louis Bridge seems destined to make an epoch in the history of construction. This gigantic work ought not to be distinguished simply as the largest bridge that has yet been constructed in Europe and America: in our eyes its principal merit will be in having demonstrated the possibility of undertaking still greater ones, enriching the science of construction with experiments and processes which notably increase its range."

RAILROAD LOANS meet so little favor in these days of depression that very few are attempted. A Belgian authority presents a table of the issues of different countries throughout the world for the first half of 1877, in which loans of railroads and all other industrial enterprises amount to but \$32,000,000 out of a total of \$288,000,000—in which Government loans count for \$242,000,000. The table is intended to be complete, but the United States does not appear in it at all, the assumption being that no loans were negotiated for this country, either railroad or Government, during the first half of this year. This is not quite true, but the amounts have been so insignificant that they would not make much difference in the totals. France appears as the largest borrower for railroad purposes (it is building too much new road), and Germany, Spain and Great Britain follow, all the rest of the world being charged with but \$4,500,000 borrowed for industrial purposes during the half-year.

LAKE AND CANAL RATES have continued to advance, part of the movement being possibly in consequence of the strike, though it does not appear that there was actually any notable increase in water shipments due to the obstruction of the railroads; or, rather, any such diversion was probably counterbalanced by the failure of a supply at the lake ports through the obstruction of the Western railroads. However this may be, the rate on corn from Chicago to Buffalo advanced 3 cents a bushel about ten days ago, and was maintained at that figure, which has been a common one in midsummer in years

before the panic, and is twice as great as earlier this season and at this time last year. Last Saturday it even touched 4 cents. The advance in the canal rate was  $4\frac{1}{2}$  to 5 cents for corn from Buffalo to New York, though early this week it showed signs of receding. Ocean rates, however, suffered, and for some time grain was taken by steam from New York to Liverpool at 4d. per bushel, but there was not much difficulty in obtaining cargoes, and there was soon an advance to 5d. and  $5\frac{1}{2}$ d.

A RAILROAD CLUB has been organized at Vienna, intended, as its circular informs us, "to bring together Austrian railroad officers of all branches of service." The objects are purely scientific. The programme includes the establishment of club rooms for reading and conversation and meetings, a library, and the publication of a club journal. The club begins with about 400 members, including "the general directors and directors of Austrian railroads, and eminent Austrian railroad officers." Mr. August Obermayer, Manager of the Empress Elizabeth Railroad, is the President of the Club.

This will be a good place for American railroad men to call when visiting Vienna, and we doubt not they will be welcomed and given opportunities to become acquainted with what is of special interest to them, but which under ordinary circumstances they do not know where to look for. There is another organization in Berlin, the "Railroad Information Society" we may call it (*Verein fuer Eisenbahnkunde*), which ought to be able to assist American railroad men in pursuit of information abroad, but it has apparently little of the nature of a club, but is more like our monthly meetings of master car-builders. There ought to be at least one in this country—in New York; and probably there might be three or four, at different railroad centres, to the advantage of all concerned.

SLEEPING CARS seem to be less popular in England than in this country, if we may trust the reports of a recent investigation made before the British Railway Commission, in which one Scotch company applied for an order to compel another to forward a Pullman car over a part of its road which forms a link in a through line between London and Perth. According to the testimony submitted to the Commission, the Pullman car on the Midland route, weighing 21 tons, had had an average of one passenger during the year ending with April last, the route being a new one with traffic probably not fully developed. On the East Coast route, which has been long established, a sleeping car weighing 13 tons had an average of three passengers daily during the four busiest months of the season. In view of these facts, the Commission decided that the unwilling road must take the Pullman car, but that it should be allowed for it as a minimum its proportion of the fares of eight passengers.

THE METROPOLITAN RAILWAY (the longest London underground line) carried at the rate of 154,137 passengers daily during the first half of 1877, the average receipt from each being about  $4\frac{1}{2}$  cents. The net earnings were sufficient to justify a dividend of  $2\frac{1}{2}$  per cent. on the common stock for the half-year. The traffic was greater than for any corresponding period in previous years. It was sufficient to fill 2,770 large American cars every day.

### NEW PUBLICATIONS.

We expected, when so many German railroad men came to this country last year, many of them sent by their governments especially to study our railroad system, that we should have some very interesting criticism in periodicals, pamphlets and perhaps books, prepared by these indefatigable students and observers, who do not often let escape them any opportunity of adding to their knowledge. Such works, intended to give information to the countrymen of the observer, are really in some respects more interesting in the country observed than anywhere else. Heretofore we have observed but slight mention of our railroads in the German journals by the returned Centennial visitors; but now we have from Mr. F. F. Kupka, of the General Inspection of the Austrian Railroads, who was charged by his government with the study of our railroads, a work of 108 octavo pages, entitled *Amerikanische Eisenbahnen*. This has chapters entitled "General," "Statistical," "State Supervision," "Pacific Railroads," "Mail Service," "Freight Traffic and Freight Rates," "Cars of Individuals and Car-Leasing Companies," "Passenger Rates and Free Passes," "Passenger Insurance and Baggage Service," "Substructure, Superstructure, Buildings and Workshops," "Road Inspection and Operation," "Rolling Stock (Cars)," "Locomotives," "Railroad Accidents," "Advertising." A few of these chapters we have seen recently published in the German technical *Organ of Railroad Progress*. A glance at Mr. Pupka's work shows that while most of his facts (of course) are familiar to railroad men here, still the work contains much that is interesting to us, as we hope to point out more at length hereafter.

Mr. Fred. H. Smith, whom engineers know best as Assistant Engineer and General Superintendent of the Baltimore Bridge Company, has written and published a little volume of 128 pages, entitled *The Pocket Geologist and Book of Minerals*. This is a very little book for so big a subject, but it contains a great deal of matter which may be of value to the prospector in the field, he being often an engineer with very little mineralogical or geological knowledge, who may yet need to give some report of material over which he has run a line or through which he has made, or is to make, a cut or tunnel. Mr. Smith's manual gives a list of the elements of the rocks in their order, and descriptions of the different varieties of rocks, which help to identify them. The larger part of the book is devoted to the minerals which have a commercial value, showing under what forms and in what circumstances each usually occurs. So concise a book is usually very dry, but Mr. Smith has written this one so agreeably that it may be read with pleasure as well as profit.

No. 30 of "Van Nostrand's Science Series" is "the Magnet-

ism of Iron Vessels, with a Short Treatise on Terrestrial Magnetism," by Prof. Fairman Rogers, who is one of the distinguished scientific men of Philadelphia, and was a member of the Compass Commission of the National Academy of Sciences. The work was first prepared as a manual for navigators, to be published by the Bureau of Navigation of our Navy Department, but this idea having been abandoned, by permission of the Bureau it was published in *Van Nostrand's Magazine* and finally in this little book.

A *History of the Steam Engine*, by Prof. R. H. Thurston, of the Stevens Institute of Technology, is announced by D. Appleton & Co.

### The Railroad Strike.

We give below a series of short notes showing as far as possible the state of the strike on all the roads concerned in it. They are necessarily brief and possibly incomplete; but they are intended to give as nearly as possible a general view of the state of the strike as we go to press.

*Baltimore & Ohio*.—The strike on this road cannot be considered as ended, though the blockade of the road has been broken. Passenger trains are running regularly and a number of freight trains have been run through under the protection of Federal troops. At the division stations, especially at Keyser, large numbers of men are still collected, who refuse to work and are only kept from stopping trains by the presence of troops. In Baltimore all trouble is over and the city is quiet. There is still trouble in Ohio, at Columbus and Newark, but an attempt to disperse the men gathered there was to be made by the State authorities on Aug. 1, the result of which has not been learned at the present writing. A statement of the company's side of the question is printed elsewhere.

*Central, of Georgia*.—This company having ordered a 10 per cent. reduction to take effect Sept. 1, the employees met in Savannah, July 26, and appointed a committee to protest. President Wadley being absent all further action was postponed, several of the directors assuring the men that the reduction would not be made.

*Central, of New Jersey*.—On July 26 all trains, both freight and passenger, were stopped at Elizabethtown, and an attempt was made to stop local trains at Philadelphia. This was unsuccessful, however, and local trains continued to run regularly from New York as far as Somerville, though no freight was moved. The blockade of the road at Philadelphia was broken July 29, a force of New Jersey militia having been sent to that place to preserve order. While trains on the Central Division are running without trouble, the Lehigh & Susquehanna Division is completely blocked. The railroad men have been reinforced by striking coal miners, and appear ready to hold out for an indefinite time. The Governor of Pennsylvania has made arrangements to protect the road, but serious trouble is feared, especially with the miners.

*Chicago, Burlington & Quincy*.—Besides the trouble resulting from the mob in Chicago there was a strike on this road at Galesburg, Ill., and also at Burlington, on the Iowa Division, where freight business was stopped for nearly a week. There was no attempt at violence and no trouble outside of Chicago. Latest accounts report the strikers as resuming work and trains running regularly. The men at the Aurora shops remained steadily at work.

*Chicago & Northwestern*.—There was no strike on this road, the order for a reduction of 10 per cent. having been revoked. Business was somewhat interrupted by a Chicago mob, however.

*Chicago, Rock Island & Pacific*.—This company had trouble with its men in Chicago and Peoria, but there does not appear to have been any general strike, and the running of trains has been resumed.

*Chicago & Alton*.—Traffic has been partially resumed on this road, most of whose trouble apparently came from the interference of outside mobs at Chicago and East St. Louis, though some of the employees struck at Bloomington and Jacksonville.

*Cincinnati, Hamilton & Dayton*.—This road having agreed to rescind the order for a reduction, there has been no stoppage beyond that caused by the riots in Cincinnati. Traffic has now been resumed.

*Cleveland, Columbus, Cincinnati & Indianapolis*.—There was at no time a strike on this road, but one was threatened, and a demand was made on the President, Mr. Devereux, that an increase of 20 per cent. on the wages paid July 1 should be made. This was declined, but Mr. Devereux met the men in the machine shop and discussed the subject with them some two hours, a very large gathering being present. The men complained that under Mr. Devereux's administration there had been three reductions, each of 10 per cent., and that in each case it was promised that wages should be raised as soon as business improved. Mr. Devereux was appealed to name a time when an increase would be made. He replied that he would assume that business would improve with the marketing of the new crops, and would promise to restore 10 per cent. on the first of August. This offer was accepted unanimously by the men who had never offered or threatened any violence, nor begun a strike even.

*Delaware, Lackawanna & Western*.—After some hesitation the engineers on this road concluded to join in the strike, and on July 26 both freight and passenger traffic was entirely stopped. The strikers offered to let a mail car go through, but the company refused to send it, unless the passenger cars went also, which was refused. On the following day, however, the men on the Morris & Essex Division returned to work and trains on that division were resumed, but were unable to run through on account of obstructions from strikers at Port Morris, Washington and Phillipsburg. A force of New Jersey militia sent to those points on July 29 compelled order and traffic on those divisions was fully resumed on July 30.

The strikers on the Main Line returned to work also on July 30 and there is now no obstruction to traffic. Many of the coal miners in the employ of the company have struck, however, and trouble with them is feared. They have forced a stoppage of the pumps at some of the mines, which will cause great damage if continued.

*Erie*.—On the 26th there were reports that a compromise had been proposed by the strikers and accepted by the company. This report was subsequently confirmed, the terms of the compromise being that the men resume work at the reduced pay, the company agreeing to discharge no one on account of the strike, to prosecute no one except for destruction of property, and to allow the trackmen to retain their houses on the company's land free of rent, they acknowledging the company's title. Work was resumed on the following day. Four of the ringleaders who were arrested are held on criminal charges.

There was at no time any strike on the Eastern Division. All passenger trains ran regularly and freight traffic was only prevented by the strikes on the other divisions.

*Galveston, Harrisburg & San Antonio*.—There was no actual strike on this road, but one had been arranged for by the trainmen, when the company agreed to advance wages 10 per cent. after Aug. 1.

*Houston & Texas Central*.—The employees at Corsicana, Texas,



struck July 26, and were followed by those at Hearne and Houston, who stopped all freight trains, but allowed passenger trains to pass. Subsequently a conference was had, at which the men demanded a restoration of the 10 per cent. reduction, which on this road was made last April. A compromise was finally agreed upon, the company agreeing to restore one-half the reduction Aug. 1 and the other half Oct. 1, and the men resumed work. There was at no time any trouble except the stoppage of freight trains for two days.

**Hannibal & St. Joseph.**—The men on this road struck on July 26, demanding a restoration of the wages paid in 1874. The firemen further demanded that Master Mechanic Simonds be discharged and that a number of men discharged by him be reinstated.

**Illinois Midland.**—Terre Haute dispatches report a resumption of traffic on this road, most of the strikers having returned to work.

**Illinois Central.**—Outside of Chicago trouble was reported at Mattoon and Centralia, which has subsided. Trains are reported as running regularly.

**Indianapolis, Cincinnati & Lafayette.**—There was no general strike on this road, though the mob at Indianapolis stopped trains for a day or two. In recognition of the steadiness of the employees, Receiver Ingalls has invited them to an entertainment to be given by him on Aug. 3.

**Indianapolis, Bloomington & Western.**—The trouble on this road lasted but a few days and work has been resumed.

**Indianapolis & St. Louis.**—As with the other roads out of St. Louis, trains have again begun to run on this road.

**Kansas Pacific.**—But little trouble has been reported on this road except at Kansas City, where the strike still continues.

**Lake Shore & Michigan Southern.**—Order has been restored on the Buffalo Division and west of Toledo the men are generally at work or ready to resume. At the Collinwood yards near Cleveland, however, the brakemen and firemen still remain out and freight traffic is accordingly blocked. No violence, beyond the stoppage of trains, has been resorted to, and the strikers claim that they have carefully protected the company's property from injury as far as possible.

**Lehigh Valley.**—The firemen and brakemen of this road struck on the night of July 26, and all traffic was at once stopped. The company has paid off and discharged most of the strikers and apparently does not intend to take any active measures to reopen its road until order is generally restored in the coal regions. Like most of the anthracite coal companies, it has coal enough on hand to meet any probable demand and is perhaps not unwilling to stop forwarding for a time. Some local coal trains have been run this week to supply furnaces, and it was proposed to run a passenger train over the road on July 31, which was done, and passenger trains began to run regularly the next day.

**Michigan Central.**—This road has had no serious strike. A suspension of business was forced at Chicago by an outside mob, but the employees on the Western and Joliet divisions resolved to continue at work. A minority of the men at Jackson attempted to force a strike, but were overruled by the others. It was agreed that the men should remain quietly at work and that, after existing troubles are ended, General Manager Ledyard will receive committees to be appointed by the employees with the view of adjusting amicably any grievances that may exist.

**Missouri, Kansas & Texas.**—Latest advices from this road are to the effect that a compromise has been proposed, which will probably be accepted.

**Missouri Pacific.**—The strike at St. Louis is reported over, but there is still trouble at Kansas City and through freight traffic has not yet been resumed.

**Northern Central.**—On the Baltimore end of the road there was no strike, but the employees at Elmira quit work. After remaining out for three or four days they returned to work and business was resumed.

**New York Central & Hudson River.**—All trouble is at an end on this road; business has been entirely resumed and all the men have returned to work. There has been no compromise on the part of the company, the men continuing work at the reduced wages, with only an implied understanding that they are to be raised should the business of the road warrant it hereafter. President Vanderbilt has announced his intention of giving \$100,000 to be divided among the employees who did not join the strike, in proportion to the amount of their monthly pay.

**Ohio & Mississippi.**—Passenger trains began to run again July 28 and some freight has been run through. This road being under control of a United States Court, the United States Marshal has made arrangements to protect trains, in which he is to have the assistance of troops. It is believed that traffic will be fully resumed this week.

**Pennsylvania.**—On the evening of July 25 a meeting of the firemen on the New York Division was held in Jersey City, at which Superintendent Barker was present and made an address. After a discussion the men finally voted not to strike. All passenger trains and the local freights on this division still run regularly. The steady continuance of work on the company's lines in New Jersey is undoubtedly largely due to the influence of Mr. Barker, who is now acting General Superintendent of the United Railroads of New Jersey Division, and who has great influence among the employees. Something is also due to the fact that the employees on this division have, many of them, been long in the service of the road and are generally settled along the line, many of them owning property there.

In Pennsylvania the track torn up at Pittsburgh has been relaid and traffic resumed on the road under the protection of United States troops and the State forces. The strike is hardly over, however, many of the men remaining out, but it is not likely that there will be any more violence or destruction of property, as the road is now too well guarded.

**Philadelphia & Reading.**—Order was restored in Reading on July 27 by the presence of a large detachment of United States troops, and the track which had been torn up was replaced. Besides the bridge at Reading the company had several coal trains wrecked and burned up, this work being done by striking miners. The strike appears to be now substantially at an end and passenger and coal trains are running regularly, although more trouble with the miners is feared.

**Pittsburgh, Cincinnati & St. Louis.**—Matters are quiet at Pittsburgh, but at Newark and Columbus the blockade of freight still continues. At Columbus the strikers are reported in full possession, though preparations were being made to oust them. West of Columbus the strike has almost subsided and a full resumption of traffic is looked for as soon as the Columbus trouble is over. Latest dispatches announce that a number of freight trains were started from Columbus on Aug. 1, under the protection of the Ohio troops.

**Pittsburgh, Fort Wayne & Chicago.**—Trouble on both ends of this road is over, but strikers remain in possession at Fort Wayne and stop all freight traffic there, though passenger trains go through. A committee sent to Pittsburgh advised a resumption of work, but the advice was not taken. No further trouble with passenger travel is expected.

**St. Louis & Southeastern.**—The freight engineers and brakemen are still on a strike, though a few trains have been kept moving by new men. The road is protected from violence by the United States Marshal, being in charge of the United

States Circuit Courts, but most of the men still refuse to work.

**St. Louis, Kansas City & Northern.**—The freight blockade by the strikers at Kansas City still continues, though the St. Louis end of the road is quiet.

**Terre Haute & Indianapolis.**—This road is still reported blocked at Terre Haute, though the blockade at East St. Louis is partially raised, and matters are quiet at Indianapolis.

**Texas & Pacific.**—The strike on this road came to an end July 30, the company agreeing to pay the men amounts due up to June 1 by Aug. 25, and up to Aug. 1 by Oct. 1, and to make wages uniform with the other Texas roads. No violence other than the stoppage of trains has been reported on this road.

**Toledo, Peoria & Warsaw.**—There was some trouble on this road at Burlington and a partial strike reported at Peoria, but they were soon over.

**Wabash.**—Latest advices are that traffic has been resumed on this road though there is still some lingering trouble at Fort Wayne. The strike was not at any time general over the whole road, being confined chiefly to Toledo, Fort Wayne and East St. Louis.

### The Baltimore & Ohio Statement of the Case.

In response to a committee who presented resolutions adopted at a meeting of strikers, Vice-President King last week addressed the following letter:

GENTLEMEN: I am in receipt of your communication inclosing resolutions adopted at a meeting of engineers, firemen, conductors and brakemen, proposing the following rates of wages: Engineers, first class, \$3.50; second class, \$3; conductors, \$2.50; firemen and brakemen, \$2 per day. In declining this proposition, it is but proper and right that the reasons which have led to this conclusion should be explained. The great depression in business which commenced in the autumn of 1873 has continued, growing from bad to worse. The effect upon the Baltimore & Ohio Company has shown continued large decrease of revenue. The other trunk lines had reduced wages 10 per cent., one of them on the 1st of June and two of them on the 1st of July, and at that date a similar reduction had been made on many of the leading lines of the country. It will be observed that the Baltimore & Ohio Company was the last company which competes for the great trade of the West which made the reduction of 10 per cent. That the whole question may be understood, I present a table of the rate of wages paid trainmen in 1861, in 1877, after the reduction, and the rate you now propose:

RATE.	TABLE OF RATES OF PAY.		
	Pay received Jan- ary, 1861.....	Pay received after reduction to per cent. July 16, 1877.....	Pay proposed by Committee.....
Tonnage Conductors.....	\$1 66 1 50 1 33	\$2 25 2 00 1 80	\$2 50 as a mini- mum.
Tonnage Brakemen.....	\$1 33 1 17 1 00	\$1 58 1 35 1 20	\$2 00 as a mini- mum.
Tonnage Enginemen.....	\$3 00 2 75 2 50 2 25 2 00 1 33	\$2 93 2 70 2 48 2 25 2 00 1 33	\$3 50 3 00 ..... ..... ..... .....
Tonnage Firemen.....	\$1 75 1 50 1 33 1 11	\$1 58 1 35 1 20 1 00	\$2 00 as a mini- mum. ..... .....

\* Premium 25 cents not included.

As compared with 1861 the rates von name will exceed those in operation at that period to the extent of about 35 per cent. The rates of through freight in 1861 were double those of 1877, and for coal the rate was \$2.31, while in June, 1877, it was but \$1.37 per ton from Cumberland to Baltimore. The officers of the company are sure that it is only necessary to submit these facts and figures to satisfy every reasonable man in the service that the wages you propose cannot be paid. Since the panic of 1873, not only have the rates of through freight and other traffic been reduced by severe and active competition, but the quantity in the aggregate has diminished. Especially is this true in regard to the coal trade, which for many years has been the leading article transported over the company's lines. The consideration of this branch of the subject brings me to call to your attention the motives which governed the company in employing a greater number of men than were required in the handling of its trains. Only a limited amount of business could be secured. It would have been quite as satisfactory to the company to have kept in the service only the number of men needed for the work, but it was regarded as more humane, in view of the great scarcity of work generally, to distribute the limited amount of business among the greatest practicable number. While it is a subject of regret that these motives have been misunderstood, and in a great degree produced the present trouble among our trainmen, it is satisfactory to know that these difficulties can be readily adjusted in such a manner as to protect mutually the interest of the company and of those it employs. Fully impressed with this belief, I hope there will be no difficulty in the way of your returning to work, so that the running of freight trains may be at once resumed.

The experience of the last ten days must satisfy every one that if freight trains are stopped on the Baltimore & Ohio Railroad the city of Baltimore is not only deprived of the great commercial advantages which she has heretofore enjoyed, but the entire community is made to feel that all business must be seriously crippled, and the price of all kinds of family supplies greatly increased. You will thus see that the resumption of the running of freight trains on the Baltimore & Ohio Railroad is a matter in which all our citizens of every calling are vitally interested.

### Steam on Street Railroads.

The Baldwin Locomotive Works have recently delivered some of their street railroad motors to the following roads: New Haven & West Haven; Newark and Irvington; Forest Home (of Milwaukee); Hill & West Dubuque, of Dubuque, Iowa. These machines are all now doing regular service. On the Newark & Irvington Railroad a motor weighing 14,000 lbs. is hauling two fully loaded cars over a grade of  $5\frac{1}{2}$  ft. per hundred, or 277 ft. per mile. On the Forest Home Railway, of Milwaukee, a motor weighing about 13,000 lbs. hauls two loaded cars over the road, two miles in length, with grades in the neighborhood of 200 ft. to the mile, in ten minutes. It has made the round trip in 23 minutes. It has also hauled three cars over the road.

The Hill & West Dubuque Street Railway has the heaviest grade which has yet been worked by a steam motor. The maximum grade, for a short distance, is 9.7 ft. per hundred (510 ft. per mile), and at other points it is 9.3 ft. per hundred.

A motor weighing about 17,000 lbs. takes one fully loaded car up this grade, and could take two cars, with ordinary load, if required. On one occasion, when drawing one open car, 125 passengers were on the car and 12 on the motor, besides the engineer and conductor, and this load was taken up the steepest grades. The steam-brake with which these machines are supplied was found to work effectively in descending the inclines.

As showing the interest which is manifested in the subject of steam traction for tramways abroad as well as in this country, the following extract from a letter from a correspondent of the Baldwin Locomotive Works in Paris is given:

"I may inform you that steam traction for tramways is making a great advance both in England and France. At the present time here in Paris 35 machines are in daily use, and they are now about to open another line of six miles, coming right into the heart of the city, also to be worked by steam. In several provincial towns also tramways are being constructed to be worked by steam power. I let you know what is going on here so far as I can, thinking it may prove interesting to you, as similar steps are being taken in your country. If at any time I can give you any further information I shall be happy in doing so. Your prices, in comparison with English and foreign makers, come out very favorable, and if it were not for the high duty they would come in very strong competition with them."

In this connection the following report of a committee appointed by the British Parliament to inquire into the subject of substituting steam for horses will prove interesting:

"The committee are of opinion that the use of mechanical power on tramways should generally be permitted, and recommend that any provisional order or private bill granting the necessary powers should contain clauses to the following effect:

"The machinery to be effectually protected and concealed from view; the ingress to and the egress from the accommodation in the passenger car to be safe, convenient, clear of the machinery and free from unpleasant noise, heat or smell; every engine to be, as far as possible, free from noise of machinery or of blast; the engine to be so constructed and worked as to avoid, as far as possible, the emission of smoke or noxious or unpleasant vapor. Two men to accompany each engine, unless by special dispensation from the Board of Trade; brake power to be provided sufficient to stop the engine and car in their own length when traveling eight miles an hour; every engine to carry a fender or some similar protection, and a bell or some sound of warning; every engine to carry a number by which it may be registered at the Board of Trade; every engine to be inspected twice each year by a competent engineer, and a report to be sent to the Board of Trade; the Board of Trade to have power to order a special inspection at the cost of the company; engines not to travel over a public road at a greater speed than at the rate of eight miles an hour in towns and twelve miles an hour in the country.

These regulations to be subject to modification from time to time by the Board of Trade; provisional orders and private bills to be subject to the provisions of any general act, existing or future; power to the Board of Trade to license the trial of any particular engine on the tramways, to which the provisional order or private bill refers, for any period not exceeding three months, anything contained in any act notwithstanding; penalties for infringing regulations, in order that local authorities or private persons interested in the improvement of mechanical power on tramways may have an opportunity of trying experiments without infringing the law or incurring the expense of a provisional order or an Act of Parliament.

Your committee recommend that a short Act of Parliament be introduced, enabling the Board of Trade to grant permission to try such experiments on any tramway on the application or with the consent of the local or road authority for such limited periods and under such regulations as the Board of Trade may impose."

### General Railroad News.

#### ELECTIONS AND APPOINTMENTS.

**Atlanta & West Point.**—At the annual meeting in Atlanta, Ga., July 25, the following directors were re-elected: John P. King, T. M. Hill, Ferdinand Phinizy, W. B. Berry, B. C. Yancy, J. S. Bigley, J. F. Moreland. The board re-elected John P. King, President; L. F. Grant, Superintendent; W. P. Orme, Secretary and Treasurer.

**California Pacific.**—At the annual meeting in San Francisco, July 13, the following directors were chosen: Charles Crocker, George E. Gray, J. O. B. Gunn, R. P. Hammond, C. J. Robinson, N. T. Smith, J. L. Willcutt.

**Central Pacific.**—The meetings of the various controlled companies were held in San Francisco, July 13, with the following results: **Amador Branch.**—Directors, Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., D. D. Colton, Charles Crocker; President, L. Stanford; Vice-President, C. P. Huntington; Treasurer, Mark Hopkins; Secretary, E. H. Miller, Jr. **Berkeley Branch, and Northern.**—Same directors and officers. **Los Angeles & San Diego.**—Directors, B. B. Redding, Charles Crocker, Mark Hopkins, J. L. Willcutt, Leland Stanford; President, B. B. Redding; Vice-President, Charles Crocker; Treasurer, Mark Hopkins; Secretary, J. L. Willcutt.

**San Pablo & Tulare.**—Directors, Leland Stanford, Willard V. Huntington, E. H. Miller, E. H. Miller, Jr., Mark Hopkins; President, Leland Stanford; Treasurer, Mark Hopkins; Secretary, E. H. Miller, Jr. **Sacramento & Placerville.**—Directors, Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., Charles Crocker, J. O. B. Gunn; President, Leland Stanford; Vice-President, C. P. Huntington; Treasurer, Mark Hopkins; Secretary, E. H. Miller, Jr. **Stockton & Copperopolis.**—Directors, Leland Stanford, C. P. Huntington, Mark Hopkins, E. H. Miller, Jr., Robert Robinson, N. T. Smith, W. E. Brown; President, Leland Stanford; Vice-President, C. P. Huntington; Treasurer, Mark Hopkins; Secretary, E. H. Miller, Jr. **Stockton & Visalia.**—The same list. **Terminal.**—Directors, Leland Stanford, Mark Hopkins, E. H. Miller, Jr., C. P. Huntington, Robert Robinson, W. E. Brown; President, Leland Stanford; Treasurer, Mark Hopkins; Secretary, E. H. Miller, Jr. **Mission Bay Bridge.**—President, Charles Crocker; Treasurer, Mark Hopkins; Secretary, J. L. Willcutt. **Potrero & Bay View.**—President, Leland Stanford; Vice-President, Charles Crocker; Treasurer, Mark Hopkins; Secretary, J. L. Willcutt. **Market Street.**—The same officers.

**Charlotte, Columbia & Augusta.**—Mr. Theodore D. Kline is appointed General Superintendent, in place of James Anderson, resigned.

**Marquette, Houghton & Ontonagon.**—At the annual meeting in Marquette, Mich., July 19, the following directors were chosen: Samuel Schoch, Marquette, Mich.; S. L. Smith, Lansing, Mich.; C. H. Palmer, Pontiac, Mich.; George Jerome, Detroit; Samuel Sloan, Moses Taylor, R. G. Rolston, John Steward, E. F. Hatfield, Jr., John Bloodgood, James J. Higginson, New York.

**Midland, Amersfort & Coney Island.**—The officers of this new company are: Wm. B. Grace, President; Chas. Flint, Secretary and Treasurer; Winchester Britton, Counsel; Chas. Crooke, Engineer.

**Portsmouth, Great Falls & Conway.**—The new board has elected Alfred P. Rockwell, President; Wallace Hackett, Clerk; Nathaniel G. Chapin, Treasurer.



**Richmond & Danville.**—Capt. E. Henry Smith is appointed Train Dispatcher at Greensboro, N. C., in place of D. P. Ligon, deceased.

**St. Joseph, Osceola & Des Moines.**—The officers of this new company are: D. Newton, President; J. W. Kellar, Vice-President; Dell. Stuart, Secretary; J. W. Richards, Treasurer. The office is at Osceola, Iowa.

**San Juan.**—The officers of this new company are: President, H. B. Greenough; Secretary and Treasurer, H. A. McIntyre.

**Southern Pacific.**—The board last week re-elected Charles Crocker President; David D. Colton, Treasurer; J. L. Willcutt, Secretary.

**Western Counties.**—Mr. M. Linskey has been appointed General Superintendent and will have his office for the present at Windsor, Nova Scotia. He was recently on the Grand Trunk road.

### PERSONAL.

—Mr. R. M. Bishop, nominated last week as Democratic candidate for Governor of Ohio, is a Cincinnati merchant and is also a director of the Marietta & Cincinnati Company, and was for some time one of the Cincinnati Southern trustees.

—Mr. Robert S. Van Rensselaer, at one time Superintendent of the Morris & Essex and later for several years General Superintendent of the Camden & Amboy, died July 26 at South Amboy, N. J., where he had gone for the benefit of his health. He had not been actively engaged in business for several years.

—Mr. J. N. Litton, of St. Louis, has resigned his position as Attorney for the St. Louis & San Francisco Railway Company, on account of ill health. The board passed resolutions expressing regret at his resignation and appreciation of his services.

—Col. David Crane, an old civil engineer and a respected citizen, died at his residence in Elizabeth, N. J., July 23, aged 63 years. He assisted Mr. James Moore, now General Superintendent of the Central of New Jersey, in making the surveys for the Elizabethtown & Somerville road, the first beginning of the Central.

—Mr. Valentine Mutchler, a railroad contractor of much experience, died at his residence in Phillipsburg, N. J., July 20. His last work was on the western end of the Easton & Amboy road. For three years past he has represented his district in the New Jersey Legislature.

—Probably the youngest railroad directors in the United States are James Blair Preston, aged 12, and William H. Blair, 10 years, who are directors of the Paulinskill Valley Railroad Company. They are, we believe, grandsons of Mr. John I. Blair, who owns the road.

### TRAFFIC AND EARNINGS.

#### Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending June 30	1876-77.	1875-76.	Inc. or Dec.	P. c.
Atlanta & West Point	\$311,159	\$283,499	Inc. \$27,660	9.8
Expenses	204,209	188,905	Inc. 15,304	11.0
Net earnings	\$106,950	\$99,594	Inc. \$7,356	7.4
Earnings per mile.	3,577	3,259	Inc. 318	9.8
Per cent. of exps.	65.62	64.76	Inc. 0.86	1.3
Six months ending June 30:				
1877.	1876.			
New Jersey Midland	\$312,863	\$286,004	Inc. \$26,859	9.4
Net earnings	68,175	61,715	Inc. 6,460	10.5
Per cent. of exps.	78.21	78.21		
Month of June:				
New Jersey Midland	\$62,750	\$56,120	Inc. \$6,630	11.8
Paducah & Elizabethtown	21,636			
Third week in July:				
Atchison, Topeka & Santa Fe	\$60,011	\$45,615	Inc. \$14,395	31.6
Denv. & Rio Grande	19,038			
Week ending July 20:				
Great Western, of Canada	\$62,030	\$65,190	Dec. \$3,160	4.8
Week ending July 21:				
Grand Trunk	\$169,078	\$163,058	Inc. \$6,020	3.7

#### Erie Canal Traffic.

The business of the Erie Canal at Buffalo from the opening up to July 31 was as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Boats cleared.....	2,318	2,136	Inc ..	8 5
Tolls received.....	\$150,771 20	\$257,083 04	Dec. \$106,311 84	41.4

The canal opened May 8 in 1877 and May 4 in 1876.

The canal opened May 8 in 1877 and May 4 in 1876.

#### Grain Movement.

For the week ending July 21 receipts and shipments of grain of all kinds were, in bushels:

	1877.	1876.	Inc. or Dec.	P. c.
Lake ports' receipts.....	4,156,585	2,938,546	Inc. 1,218,039	41.5
" " shipments.....	3,233,327	3,302,159	Dec.. 68,832	2.1
Atlantic ports' receipts...	2,293,369	2,941,844	Dec.. 648,475	22.0

Of the lake ports' shipments, 18 per cent. went by rail this year, against 31½ in 1876, 18½ in 1875 and 15½ in 1874. Of the receipts at Atlantic ports, 53½ per cent. were at New York, 14½ at Baltimore, 10.1 at Philadelphia, 9.8 at Montreal, 7.4 at Boston, 4.4 at New Orleans and 0.3 at Portland. This is the fifth week that New York has received more than one-half of the total sea-board receipts.

Buffalo grain receipts for the seven months ending July 31 are reported as follows by the Commercial Advertiser of that city:

	Flour.	Grain.
By lake	1877. 297,011	1876. 286,598
By rail	566,000	635,200
Totals	863,011	921,798

The decrease this year in flour was 9.6 per cent., and in grain 8.9 per cent. Rail receipts this year were 67.9 per cent. of the flour and 27.7 per cent. of the grain. Shipments eastward for the same period were:

	1877.	1876.	Inc. or Dec.	P. c.
By canal, bushels.....	13,316,330	12,372,620	Inc. 943,710	7.6
By rail.....	2,921,319	6,337,503	Dec. 3,416,184	53.9
Total .....	16,237,649	18,710,123	Dec. 2,472,474	13.2

Rail shipments were 18 per cent. of the total in 1877 and 34 per cent. in 1876. The canal opened May 8 in 1877 and May 4 in 1876.

#### Coal Movement.

Coal tonnages for the week ending July 21 are reported as follows:

	1877.	1876.	Inc. or Dec.	P. c
Anthracite .....	472,614	198,121	Inc. 274,493	183.6
Semi-bituminous.....	34,616	82,522	Dec. 47,906	58.1
Bituminous, Pennsylv'a	27,131	34,060	Dec. 6,919	20.3

Shipments from the Cumberland region were almost stopped

### LOCOMOTIVE RETURNS, MARCH, 1877.

Master Mechanics of all American railroads are invited to send us their monthly reports for this table.

NAME OF ROAD.	Number of miles operated.	Number of Locomotives in service.	Mileage.		No. Miles run to		Average cost per freight car per mile, cents.		Cost per Mile in Cents for					Av. cost of	
			Total.	Average per En- gine.	Ton of Coal.	Cord of Wood.	Repairs.	Fuel.	Stores.	Miscellaneous.	Total.	Coal, per ton of fuel.	Wood per cord.		
Allegheny Valley (River Division)*.....	130	91,271	32.60	19.58	20.40	1,083	8.13	4.12	0.71	7.07	20.03				
"    (Low Grade Div.).....	120	48,916	23.42	21.10	20.10	0.936	4.26	5.26	0.71	7.03	17.26				
Atlantic & Great West'n (1st & 2d Divs.)†	228	83	195,893	3,260	37.25	17.82	4.37	5.19	0.66	0.76	6.19	17.06	1.81		
"    (Third & Fourth Divs.)†	197	48	121,619	2,349	37.25	30.19	4.35	5.19	0.44	0.82	5.79	16.69	3.02		
"    (Mahoning Division)†.	197	48	102,919	1,942	37.25	21.17	4.35	5.19	0.44	0.82	5.79	16.69	3.02		
Atlantic & Gulf.....	343	21	68,454	3,259	56.60	19.53	3.46	4.35	0.45	0.39	7.19	15.78	2.47		
Cairo & Vincennes.....	157	11	23,120	2,012	37.20	14.20	7.11	4.10	0.41		6.23	17.85	1.50		
California Pacific.....	182	14	32,121	2,294	57.30	50.47	18.06	13.46	0.55	0.29	7.49	39.85	6.00		
Camden & Atlantic.....	67	13	18,142	1,395	58.00	15.60	5.96	7.22	0.70		5.32	19.20	4.12		
Central Pacific (Western Division)†	201	53	126,462	2,385	47.58	20.28	12.21	15.28	0.54	0.87	8.54	37.14	7.25		
"    (Visalia Division)†	157	14	36,479	2,066	46.26	18.75	4.77	18.71	0.83	0.68	6.32	27.38	7.25		
"    (Tulare Division)†	171	19	32,442	2,704	39.50	11.30	4.54	18.40	0.85	0.29	8.53	32.61	7.25		
"    (Los Angeles, Yuma, San Diego and Wile. Divs.)†	304	19	57,389	3,020	48.24	15.59	3.96	15.07	0.71	0.03	7.36	27.13	5.00		
"    (Sacramento Division)†	120	41	97,984	2,390	109.65	29.02	10.13	16.89	0.60	0.36	8.67	36.67	7.25		
"    (Oregon Division)†	152	6	17,977	2,995	40.30	21.84	5.20	12.40	0.50	0.28	8.67	27.05	5.00		
"    (Truckee Division)†	205	25	66,157	2,646	38.53	27.66	16.49	13.46	0.63	0.54	8.36	44.54	7.25		
"    (Humboldt Division)†	201	18	47,763	2,654	45.98	18.12	10.60	15.80	0.57	0.42	7.61	35.00	5.00		
"    (Salt Lake Division)†	219	27	79,226	2,934	39.86	15.04	3.71	16.09	0.59	0.50	6.99	30.78	7.25		
Cleve., Col., Cin. & Ind. (Col'bus Div.).....	138	58	166,988	2,878	44.39	37.14	2.79	4.42	0.54	0.82	5.79	14.36	7.35		
"    "															



Court on the petition of this company for leave to sell the Vermont Central and Vermont & Canada roads was begun. A number of counsel, representing all the parties in interest, are to be heard and the case is expected to take up at least a week. Latest dispatches say that the hearing has been concluded and the case taken under advisement.

#### Chester & Lenoir.

The grading is now completed to Lincolnton, N. C., 16 miles northward from the terminus at Dallas, and tracklaying will soon be begun.

#### Columbus, Chicago & Indiana Central.

The New York Supreme Court has dismissed the suit begun by Mr. Brown, a bondholder, to enforce the Pennsylvania Railroad Company's guarantee of the lease of this road to the Pittsburgh, Cincinnati & St. Louis. The Court holds that, from the nature of the case the suit cannot be maintained by an individual bondholder but that a suit to enforce the guarantee must be brought by the company.

#### Dividends.

Dividends have been declared as follows:

New York, Providence & Boston, 2½ per cent., quarterly, payable Aug. 10.  
Illinois Central, 2 per cent., semi-annual, payable Sept. 1.

#### Foreclosure Sales.

Sales of railroad property under judicial process are noted as follows:

Arkansas Central, at Helena, Ark., July 26, under decree of foreclosure granted by the United States Circuit Court. Purchased by S. H. Horner, trustee, for \$40,000. The road, which is of 3 ft. gauge, has been completed for several years from Helena to Clarendon, 48 miles. By the latest report there were \$720,000 first and \$700,000 second-mortgage bonds outstanding, the first-mortgage bonds being guaranteed by the State of Arkansas.

The Lake Erie, Evansville & Southwestern is advertised to be sold at Seymour, Ind., Oct. 31, under a decree of foreclosure granted by the United States Circuit Court. The sale will include 20 miles of finished road from Evansville, Ind., to Booneville, and all grading, right of way, equipment and other property of the company. The terms are cash to the amount of the costs of the suit and sale; the balance either in cash or in bonds and coupons of the company. If payment is made in bonds, time will be allowed for the deposit of the same, on the filing in court of an approved bond for the payment of the amount due.

The sale of the Dismal Swamp Canal has been postponed. A meeting of the bondholders was held in Norfolk, Va., last week, at which it was agreed to postpone the sale until after the next session of Congress, to see if that body would take any action, in view of the interest in the canal owned by the United States.

#### Hamilton & Northwestern.

A contract has been let to Mr. J. D. Macdonald for the extension of the Lake Erie Division from Jarvis, Ont., to Port Dover, about eight miles. The company is also preparing to build a coal wharf at Port Dover.

On the Northwestern Division track has been laid some seven miles beyond Georgetown, Ont., and is expected to reach Barrie by October. A contract has been let for the grading of the branch from Clarksville to Glencairn, about 20 miles.

#### Kansas City, St. Joseph & Council Bluffs.

Local papers report that this company is considering the question of taking up its line along the Missouri River in Iowa, and replacing it by a line running through Sidney, Taylor and Glenwood, some miles back from the river. The proposed change is on account of the constant damage to the present line from high water in the Missouri. It is said that the people of several towns on the proposed new line have offered to raise \$100,000 if the company will build it.

#### Kings County Central.

It is said that work will soon be begun on this road, which is to run from Prospect Park in Brooklyn, east by south through Flatbush to a connection with the New York & Manhattan Beach road, about four miles.

#### Lafayette, Muncie & Bloomington.

The Court has authorized the Receiver to buy 300 tons of steel rails, to be laid between Lafayette, Ind., and Templeton, and to make some other needed improvements in the track.

#### Lake Erie, Alliance & Wheeling.

This company is again negotiating with the Painesville & Youngstown for a connection of the two roads at Southington, O., and the joint use of the track from that point to Painesville.

The track is now laid to the crossing of the Atlantic & Great Western at Braceville, O., which is about 24 miles northward from Alliance and 10 miles beyond Palmyra, the last point noted. Work is in progress north of Braceville.

#### Lake Erie & Louisville.

A survey is being made for an extension of this road according to the original design, from St. Mary's, O., southwest to Union City, Ind., 36½ miles; also for a branch line from St. Mary's west by south to Muncie, Ind., 61½ miles. The company is also trying to secure local subscriptions for an extension of the line from Fremont, the Northern terminus, east about 24 miles to Sandusky.

#### Lake Shore & Michigan Southern.

The gauge of this road was to be changed last week from 4 ft. 9½ in. to 4 ft. 8½ in. on the section between Buffalo and Cleveland. All necessary preparations had been made, but the strike has possibly delayed the change. The old gauge was adopted as a compromise between the 4 ft. 10 in. of the Ohio lines and the 4 ft. 8½ in. of most of the other connections of the road. Of the section to be altered the line from Cleveland to Erie—the Cleveland, Painesville & Ashtabula—was originally 4 ft. 10 in., the old Buffalo & State Line was 4 ft. 8½ in., while the Erie & State Line was built of 6 ft. gauge, but afterwards changed to 4 ft. 8½ in. The present change is made as a matter of convenience, chiefly to obviate the necessity of using the compromise cars with broad-tread wheels.

#### Long Island.

A reduction in the pay of some of the employees on this road had been decided on, but, on representations made by a committee of the men, the company has agreed to postpone it for the present, and also promises to name a regular pay day in each month.

#### Manchester & Fitchburg.

The City Council and a number of citizens of Manchester, N. H., raised over the line of the projected road from that place to Fitchburg, Mass., in carriages on July 26, and at the close of the trip a meeting was held in Fitchburg, at which a number of speeches were made in favor of the building of the road.

#### Meetings.

Meetings will be held as follows:

Texas & Pacific, annual meeting, at the company's office in Philadelphia, Aug. 14, at 2 p. m.  
Spartanburg & Asheville, annual meeting, in Henderson, N. C., Aug. 9.

#### Memphis & Charleston.

A Nashville (Tenn.) dispatch says that this company has paid to the State of Tennessee \$1,671,916 in State bonds, being the amount of its debt to the State and interest. It is understood that the amount required to purchase the bonds was in

part advanced by the East Tennessee, Virginia & Georgia Company, or parties interested in that company, and that the lease of the road to that company will probably be made as heretofore agreed.

#### Memphis & Little Rock.

This company has secured a temporary injunction restraining the St. Louis, Iron Mountain & Southern from preventing the passage of its trains over the Little Rock bridge.

#### Midwest, Amersfort & Coney Island.

A company by this name has been organized to build a railroad from the eastern side of Prospect Park in Brooklyn, southward through Flatbush and Flatlands village to Sheepshead Bay and thence to Coney Island, a distance of about 7½ miles. This route will, it is expected, command some local business, besides the pleasure travel to Sheepshead Bay and Coney Island. Agents are now negotiating for the right of way, and it is said that work will be begun soon.

#### Morgantown & Baltimore.

It is proposed to build a railroad from Morgantown, W. Va., southeast to Kingwood and thence to the most convenient point on the Baltimore & Ohio, about 25 miles in all. It is proposed to raise the money by county subscriptions from Monongalia and Preston counties.

#### New Jersey Midland.

The Receivers' report of earnings for June and the six months ending June 30 is as follows:

	June.	Six months.
Passengers.....	\$14,249 38	\$61,524 91
Freight.....	22,344 08	119,129 66
Milk.....	16,561 43	87,506 29
Express and miscellaneous.....	9,595 11	44,401 73
Total.....	\$62,750 00	\$312,862 59
Working and terminal expenses.....	52,118 32	244,687 26
Net earnings.....	\$10,631 68	\$68,175 33
Per cent. of expenses.....	83.06	78.21

The Receivers' cash account is as follows:

Balance on hand June 1.....	\$2,410 70
Receipts, as above.....	62,750 00
Loan account.....	11,101 77
Total.....	\$76,262 47
Expenses, as above.....	\$52,118 32
New construction.....	4,327 93
Right of way claims.....	973 88
Equipment account.....	1,709 89
Trackage etc., at Middletown.....	452 00
Middletown, Unionville & Water Gap lease.....	3,500 00
Discount and interest.....	209 60
Loan account.....	12,751 77
Total.....	\$76,043 30

Balance, July 1.....\$219 08

As compared with 1876, the gross earnings for June show an increase of \$6,630.24, or 11.8 per cent.; for the half-year an increase of \$26,858.65, or 9.4 per cent. The improvement made is in spite of a falling off in the ore business.

#### New York, Providence & Boston.

In the midst of the general strike this company has ordered a reduction of 10 per cent. in all salaries and wages over \$30 per month, to take effect Aug. 1.

#### Osage Valley & Southern Kansas.

Negotiations are in progress for the extension of this road from Tipton, Mo., where it connects with the Missouri Pacific, southward about 17 miles to Versailles, in Morgan County. The completed section, from Tipton to Booneville, is worked by the Missouri Pacific, and it is thought that that company may give some aid to the proposed extension.

#### Pennsylvania.

A commencement has been made on the long contemplated straightening of the deep cut through Bergen Hill on the New York Division. Only a small force is employed on the work, however, and it is to be prosecuted very slowly, there being no special necessity for hastening it. The stone taken out will be used for replacing the gravel ballast formerly used on this division, and the work will probably go on only as fast as the stone taken out can be profitably used.

#### Philadelphia & Atlantic City.

The final opening of this road took place July 25, when a large number of excursionists passed over the road. The opening was in one respect unfortunate, one of the excursion trains running off the track, killing one person and injuring ten others.

#### Portland, Salt Lake & South Pass.

A largely signed memorial has been prepared in Portland, Oregon, asking Congress to grant to this road a land grant for the section of the road from the Columbia River at Umatilla to Salt Lake; also to make the line from Umatilla to Portland common for both this road and the Northern Pacific, the land grant for that section to go to the company whose road is first completed to Portland.

#### Port Royal.

Recently a suit was begun by Mr. A. Iselin in the New York Supreme Court to enforce the guarantee of the Georgia Railroad Company on \$500,000 bonds of the Port Royal Company, some of which Mr. Iselin holds, and the Court granted an attachment against the Georgia Company. Interest on the guaranteed bonds was paid by the guarantor up to May 1, 1877, when payment was withheld. The case was up last week on a motion to vacate the attachment, but after hearing argument the Court refused to grant the motion.

#### San Juan.

A company by this name has been organized to build a railroad from Fort Garland, Col., to Salt Lake, Utah, by way of Del Norte, the Rio Grande and Animas valleys. The capital stock is fixed at \$1,500,000.

#### St. Joseph, Osceola & Des Moines.

This company was recently organized at Osceola, Ia., to build a narrow-gauge road from Des Moines, Ia., south by west to Osceola, about 45 miles, with the intention of extending it hereafter from Osceola southwest to the Missouri line, some 40 miles further.

#### St. Paul & Duluth.

This company is organized under the agreement made by the Lake Superior & Mississippi and issues no securities but preferred and common stock, and no mortgage can be put on the property without written consent of two-thirds of the preferred and a majority of the common stock. The preferred stock is to bear 7 per cent. interest, provided the earnings and land receipts are sufficient, is to be receivable in payment for lands at par, and any surplus of land receipts is to be used in retiring it by purchase; it is to be issued to the old bondholders at the rate of \$1,200 for each \$1,000 bond with the unpaid coupons. The common stock is to be issued in exchange for the income bonds and floating debt claims at par, and to the old stockholders at the rate of one share of new stock for 20 shares of old stock. Holders of stock will have one vote for each \$100 of preferred and each \$300 of common stock. Expenses of reorganization and back pay due are to be paid from the first earnings of the road.

#### St. Paul & Pacific.

Our Amsterdam correspondent writes: "Subscriptions are

asked for \$288,000 (7,200 shares at \$40, currency) to build the connecting line from Barnes to Breckenridge, 32 miles. The committee asking the subscriptions say that very high rates will be allowed by Receiver Farley, to assure a high rental, and the payment of the capital invested within four or five years."

#### South Pacific Coast.

The rails on this road are now laid from the bay terminus at Dumbarton Point, Cal., south to Los Gatos, 30 miles, and nearly all the track is ballasted. A force has begun grading on the extension from Newark north to Alameda. The rails are of iron, 50 lbs. to the yard, and the road is equipped with 3 engines, 4 passenger, 2 baggage, 10 box and 70 flat cars. The shops are at Newark and include a round-house for seven engines; a car shop, 54 by 150 ft.; machine-shop, 42 by 150 ft.; blacksmith shop, 22 by 34 ft. and some smaller buildings. Several cars are being built for the road in these shops. The road is of 3 ft. gauge.

#### Southern Pacific.

At the annual meeting in San Francisco last week it was decided to go on with the work and extend the road from Fort Yuma up the Gila Valley into Arizona, 200 miles eastward from Fort Yuma to be built this year.

#### Umatilla & Grand Ronde Valley.

A survey is being made for a narrow-gauge railroad from Umatilla, Oregon, on the Columbia River, east by south to La Grande in the Grand Ronde Valley. The distance is about 130 miles and the road will serve the best settled section of Eastern Oregon.

#### Wabash.

From July 1 this company makes a monthly assessment upon its employees for the purpose of paying surgeons in cases of accidents to employees of the road. Those receiving \$50 per month or less will be assessed 3 cents; those receiving from \$60 to \$75, 5 cents; and those over \$75, 10 cents.

The following circular to bondholders has been issued:

"The following modification of the circular of Jan. 24 has been found necessary:

"The coupons of the Decatur & East St. Louis first mortgage, due August 1, 1877, and the coupons of the Quincy & Toledo first mortgage, due May 1, 1877, will be paid on the 1st of September next, instead of the 1st of August, as heretofore announced.

"The coupons of the Toledo & Wabash, Wabash & Western, and Great Western second mortgages, due May 1, 1877, will be paid on the 1st of October next.

"The quarter coupons of the Toledo, Wabash & Western consolidated mortgage, due August 1, 1877, will be paid on the 1st of November next.

"As a condition of and prior to these payments the coupons in default, with the others, as specified in the circular of Jan. 24, must be deposited in trust in the Metropolitan National Bank, as heretofore announced, the holder receiving scrip therefor bearing a graduated interest at the rate of 3 per cent. in 1878, 4 per cent. in 1879, 5 per cent. in 1880, and 6 per cent. in 1881 and thereafter. The holders of the Toledo & Wabash and of the Wabash & Western bonds must also assent to an extension of the time of payment of the principal of these bonds on receiving additional coupons to 1893, the time of the maturity of the Great Western issue.

"Full information in regard to these modifications of the original funding plan, and as to the financial condition of the company, can be obtained of the Committee of the Wabash Railway Company, at No. 52 William street, room No. 10, where the coupons to be funded will be received and the scrip delivered."

#### Western Counties.

It is said that the Canadian Government will transfer to this company on or soon after Aug. 1 the Windsor Branch from Windsor Junction on the Intercolonial to Windsor, N. S., 32 miles. The right of the Windsor & Annapolis Company to the use of the branch will probably be adjusted by mutual agreement.

#### Yaquina Bay.

Work has been begun on this road from Corvallis, Oregon, in the Willamette Valley, to Yaquina Bay, and a considerable force is employed on the grading. Much of the work will be done by the people along the line. The Company has a grant of all the swamp and tide lands in Benton County.

### ANNUAL REPORTS.

#### Toledo, Wabash & Western.

The lines owned by this company during the calendar year 1876 were:

	Miles.
Main line, owned, Toledo, O., to Camp Point, Ill.....	452.0
" " leased, Camp Point, Ill., to Quincy.....	21.5
St. Louis Division, owned, Decatur, Ill., to East St. Louis.....	108.5
Keokuk Division, owned, Clayton, Ill., to Elvaston.....	34.5
" " leased, Elvaston to Keokuk, Ia.....	7.0
Naples Branch, Bluffs, Ill., to Naples.....	4.0
Total (699 miles owned).....	627.5

The company had also leased the following lines, the earnings of which are stated separately:

	Miles.
Lafayette, Muncie & Bloomington, Lafayette, Ind., to State Line.....	36.0
Lafayette, Bloomington & Mississippi, State Line to Bloomington, Ill.....	80.3
Pekin, Lincoln & Decatur, Decatur, Ill., to Pekin.....	67.2
Hannibal & Naples, Naples, Ill., to Hannibal, Mo.....	46.0
" " Pittsfield Branch.....	6.0
Total.....	235.5

The 627.5 miles covered by the report have since been transferred to the Wabash Railway Company, organized by the bondholders who bought the property under foreclosure of the consolidated gold mortgage, assuming prior bonds amounting to \$17,609,000, and arranging with the holders thereof to fund overdue coupons.

The equipment consists of 196 engines; 67 passenger and 49 baggage, mail and express cars; 2,973 box, 525 stock, 688 flat and coal and 93 caboose cars; 36 service cars.

The report for 1876 is made by the Receiver, the new company not taking formal possession until after Jan. 1, 1877. The work done for the year was as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Train mileage, passenger.....	1,207,859	1,185,882	Inc.	21.677 1.8
" " freight.....	2,357,983	2,419,573	Dec.	61,588 2.5
Total revenue mill'ge.....	3,565,844	3,605,455	Dec.	39,611 1.1
Passengers carried.....	936,099	880,664	Inc.	55,435 6.3
Passenger mileage.....	40,875,026	37,619,009	Inc.	3,256,017 8.7
Tons freight carried.....	1,232,632	1,092,219	Inc.	140,413 12.9
Tonnage mileage.....	301,758,274	214,499,666	Inc.	87,258,608 40.6
Av. pass. train load, No. ....	33.86	31.72	Inc.	2.14 6.7
Av. freight " " tons.....	127.97	89.65	Inc.	39.32 44.4
Av. receipt per ton per cent.....	0.94	1.16	Dec.	0.22 19.0

Of the tons carried in 1876, 69.5 per cent. were local freight. The earnings for the year were:

	1876.	1875.	Inc. or Dec.	P. c.
Passengers.....	\$1,187,874 06	\$1,142,708 90	Inc.	\$45,165 15 4.0
Freight.....	2,829,652 38	2,484,171 91	Inc.	345,480 47 14.0
Mail and express.....	243,850 65	378,292 85	Inc.	134,303 53 5.3
Miscellaneous.....	148,845 73			
Total.....	\$4,410,222 81	\$4,004,273 66	Inc.	\$405,949 15 10.1



Expenses, renew- als and taxes..	1876. 3,554,410 31	1875. 3,499,767 00	Inc. or Dec. Inc.. 54,643 31	P. c. 1.6
Net earnings..	\$855,812 50	\$504,516 66	Inc.. \$351,295 84	69.6
Gross earnings per mile.....	7,028 24	6,381 31	Inc.. 646 93	10.1
Net earnings per mile.....	1,363 84	804 01	Inc.. 559 83	69.6
Per cent. of exps.	80.59	87.40	Dec.. 6.81	7.8
From the net earnings for 1876 are to be deducted \$255,532 for construction and equipment, \$70,000 for rental of Wabash Equipment Company's cars, and \$59,755 track rentals, making \$385,287 in all, leaving a net balance of \$470,525.50, which is 2.67 per cent. on the \$17,609,000 bonded debt.				
The Receiver's account in brief from Feb. 23, 1875, to March 31, 1877, is as follows:				
Gross receipts.....			\$7,834,515	
Less expenses and taxes.....			6,568,806	
Balance.....			\$1,265,709	
Surplus earnings Hannibal Bridge.....			199,870	
Surplus from 235.5 miles leased lines.....			68,874	
Sundry accounts.....			28,094	
Decrease of floating assets.....			620,639	
Total.....			\$2,143,138	
Decrease in floating liabilities.....			\$1,076,159	
Construction and improvements.....			337,890	
Rental Wabash Equipment Co. cars.....			140,000	
Rental Hannibal Bridge.....			104,097	
Track rentals.....			9,778	
Hannibal Bridge improvements.....			64,274	
Settlement of accounts, leased lines, etc.....			3,300	
Bondholders' Committee.....			15,249	
Supplementary account earnings and expenses, Jan 1 to March 31, 1877.....			\$1,910,617	
Balance.....			\$292,569	

Which is represented by material and supplies turned over to the Wabash Railway Company. The net result from the leased lines is made up by a surplus of \$37,132 from the Lafayette, Muncie & Bloomington; a surplus of \$62,261 from the Lafayette, Bloomington & Mississippi; a surplus of \$24,662 from the Pekin, Lincoln and Decatur; and a deficit of \$55,184 on the Hannibal & Naples.

The report says: "The business of the past two years has also seemed to demonstrate the fact that the fast freight lines, whether those formed by the partnership with the railways in the cars, etc., used upon them, or those which are independent joint stock companies, cost the railway entirely too much to be paid for by any benefits received. The cars owned by the company and kept on its own line in general freight business have been made to earn each over \$1,000 per annum, while the cars in the fast freight lines have only earned about \$500. This business could have been done quite as well had the trunk lines been willing to co-operate in a simple but effective business interchange of freights, without the cumbersome and expensive organization of the fast freight lines and their disproportionate amount of rolling stock when compared to earnings. These lines are an incubus upon the railway system of the country, which sooner or later must be gotten rid of."

"The Receiver turned over the possession of the property and its management to the purchasers, John W. Ellis and others, trustees, on the first day of January last. The new Wabash Railway Company was organized soon after, and is in complete control and operation of the road."

"While the work done in all the departments was nearly the same in 1876 as in 1875, the cost was 33 per cent. (nearly \$2,000,000 less) in 1876 than in 1875, and while the gross revenue of 1875 was \$1,328,581 greater than that of 1876, it did not meet the expenses of that year by \$161,361, while the smaller revenue of 1876 was \$467,090 in excess of the expenses, making the difference of \$628,452 on the net result in favor of the year 1876."

"The most striking peculiarity of the freight business of the Wabash Railway is found in the comparatively small difference between the local and through rates. This is occasioned by the fact that the line being a diagonal one between Lake Erie and St. Louis, it is cut at very numerous points by East and West lines which are in direct competition with it. 'Competitive' points, therefore, are almost as numerous as the counties through which the road runs, and the rates from these points being necessarily 'through' rates, no very marked difference can be made at the few small stations intervening. This is a fixed fact in regard to the business of the road which cannot be removed, and must be taken into the account whenever the character of the road is analyzed. This difference, however, though comparatively small, is of serious importance when it affects a large volume of business, and the policy steadily pursued for two years past of localizing the business as far as possible shows its fruit in the increase of the proportion of freight carried at local rates to that carried at through rates, which has been attained without sacrifice of any class of business."

#### Train Accidents in June.

The following accidents are included in our record for the month of June:

##### REAR COLLISIONS.

On the 2d, as a Boston & Albany freight train was backing into a high coal siding at Pittsfield, Mass., it struck a coal car and forced it off the end of the siding, wrecking it and injuring three men.

On the evening of the 7th a freight train on the Pennsylvania Railroad ran into the rear of a preceding freight in Jersey City, N. J., wrecking several stock cars.

On the morning of the 9th a freight train on the Erie Railway ran into some cars which had broken loose from a preceding freight on the grade near Portage, N. Y. Several cars were wrecked.

Late on the night of the 13th an express train on the Pittsburgh, Cincinnati & St. Louis road ran over a misplaced switch near Indianapolis, Ind., and into a lot of cars standing on a siding. The engine and several stock cars were completely wrecked, the baggage and postal cars thrown down a bank and a mail clerk hurt badly. The switch had been purposely set wrong and an old tie wedged in to keep it so.

On the 16th a Missouri Pacific train backed into another train at the depot in Leavenworth, Kan., damaging a passenger car.

On the night of the 19th an express train on the Canada Southern broke in two near Ecorse, Mich., and the rear section ran into the forward one, doing some damage and injuring a passenger.

Very early on the morning of the 19th a freight train on the Erie Railway broke in two near Gwynard, N. Y., and the rear section ran into the forward one, doing some damage and injuring a man who was stealing a ride.

On the morning of the 26th a passenger train on the Chicago & Alton road ran over a misplaced switch and into the rear of a freight train, which was standing on a siding at White Hall, Ill. Several cars were badly broken and the road blocked two hours.

On the night of the 28th a freight train on the Erie Railway ran into the rear of a preceding freight, which had stopped to switch some cars at Genesee, N. Y. Several cars were wrecked, the locomotive damaged and a man in the caboose slightly hurt.

##### BUTTING COLLISIONS.

On the morning of the 8th there was a butting collision be-

tween a freight and a repair train on the Belvidere Division of the Pennsylvania Railroad, near Reigelsville, N. J. Both engines were badly damaged, an engineman severely and a fireman slightly hurt. The trains had both received orders, but it is said that the repair train conductor failed to obey.

On the afternoon of the 11th, near Bethalto, Ill., on the Indianapolis & St. Louis road, there was a butting collision between a stock train and a wild engine, by which both engines were damaged and one of the enginemen hurt. It is said that the accident resulted from a mistake as to the number of extras in giving orders to the wild engine.

On the morning of the 12th, near Point of Rocks, Md., on the Baltimore & Ohio road, there was a butting collision between an excursion and a regular passenger train, by which both engines and several cars were wrecked, five persons killed and 29 hurt. It is said that the collision resulted from carelessness of the trainmen. The coroner's jury could not agree, but were disposed to censure the train dispatcher for not giving more definite orders.

On the afternoon of the 13th there was a butting collision between two freight trains on the Pittsburgh, Cincinnati & St. Louis road near Mastersville, O., by which both engines were badly broken, a fireman killed and an engineman hurt. It is said that the conductor of one of the trains failed to obey the orders given him.

On the 14th there was a butting collision in Indianapolis between a Jeffersonville, Madison & Indianapolis switching engine and an Indianapolis & Vincennes gravel train, doing some damage.

On the night of the 21st as a passenger train on the Philadelphia & Reading road was standing at the depot in Reading, Pa., a man jumped on the engine and started it (no one being on board at the time) and it ran some distance out of the depot and into the head of a yard engine, damaging both engines. The man was arrested, but his object in starting the engine does not appear.

On the 23d a freight train on the Lake Shore & Michigan Southern road ran over a misplaced switch and into the head of a working train, which was standing on a siding at Wakeman, O., damaging an engine and several cars.

##### CROSSING COLLISIONS.

On the morning of the 30th a passenger train on the Philadelphia & Reading road ran into a coal train which was crossing the main track to go upon the Mine Hill Branch at Schuylkill Haven, Pa. The coal engine was thrown over on one side, the cylinder torn off, and the passenger engine was also badly damaged. It is said that the coal train men disobeyed orders in starting across the track when the passenger was due.

##### DERAILMENTS, BROKEN AXLE.

On the night of the 8th some cars of a freight train on the Central Railroad of Georgia were thrown from the track by a broken axle near Buckhead, Ga., blocking the road all night.

On the evening of the 15th the engine of a passenger train on the Chicago, Milwaukee & St. Paul road was thrown from the track near Berlin, Wis., by the breaking of a driving axle under the engine.

On the afternoon of the 16th, a car of a freight train on the Pennsylvania Railroad was thrown from the track by a broken axle at Wilkesburg, Pa., blocking one track an hour.

On the 17th, as an express train on the New York Central & Hudson River was approaching the depot in Syracuse, N. Y., a passenger car had one of the trucks thrown from the track by the breaking of an axle. It broke in the journal, which was found to be very hot.

On the evening of the 25th, the engine of a passenger train on the Indianapolis & Vincennes road was thrown from the track at Brooklyn, Ind., by a driving axle breaking close to the hub of the wheel. The road was blocked three hours.

##### DERAILMENT, BROKEN WHEEL.

On the night of the 2d, five cars of a freight train on the Erie Railway were thrown from the track near Callicoon, N. Y., by a broken wheel, blocking the road several hours.

##### DERAILMENT, BROKEN BRIDGE.

On the morning of the 19th, a mail train on the Southwestern Division of the Chicago, Rock Island & Pacific road went through a bridge near Washington, Iowa. The engine, baggage and two passenger cars went down, leaving the sleeping car with one end hanging over the gap. The baggage man was fatally hurt, the engineman, fireman and express messenger less severely injured and eight passengers were bruised. The abutments of the bridge had been undermined by a freshet.

##### DERAILMENTS, SPREADING OF RAILS.

On the morning of the 15th a passenger train on the European & North American road was thrown from the track near McAdam Junction, N. B., by the spreading of the rails, injuring a passenger and blocking the road several hours.

Very early on the morning of the 29th the engine and two cars of a passenger train on the Missouri, Kansas & Texas road were thrown from the track by the spreading of the rails near Osage Mission, Kan. The engineman was injured.

##### DERAILMENTS, WASH-OUTS AND LAND-SLIDES.

On the morning of the 6th a passenger train on the Columbus & Hocking Valley road was thrown from the track by a land-slide near Sugar Grove, O. The locomotive went down a bank into the river, two cars were badly broken, two trainmen and two passengers hurt.

On the morning of the 8th a passenger train on the Hannibal & St. Joseph road was thrown from the track by a wash-out near St. Joseph, Mo.

On the 9th a freight train on the Hannibal & St. Joseph road was thrown from the track by a wash-out near Cameron, Mo., and several cars were wrecked.

On the 9th a freight train on the Mississippi Central road ran into a washed-out culvert near Hickory Valley, Miss., wrecking the engine and several cars, killing the engineman and two brakemen.

On the morning of the 30th a train on the New York & Canada road was thrown from the track near Patterson, N. Y., at a place where an embankment had slid out of place. The engine was wrecked, the engineman killed and the fireman hurt.

##### DERAILMENTS, MISPLACED SWITCH.

On the 8th the engine and one car of a repair train on the Hartford, Providence & Fishkill road were thrown from the track by a misplaced switch at Terryville, Conn.

On the morning of the 12th a passenger train on the Wisconsin Central road was thrown from the track by a misplaced switch at Auburndale, Wis. The switch is believed to have been purposely set wrong.

On the afternoon of the 16th an express train on the New York Central & Hudson River was thrown from the track by a misplaced switch in Utica, N. Y.

On the night of the 29th a freight train on the Erie Railway was thrown from the track by a misplaced switch at Almond, N. Y. The engine remained on the ties, but several cars went down a high bank and were wrecked.

##### DERAILMENTS WITH MALICIOUS INTENT.

On the night of the 2d, as an express train on the St. Louis & San Francisco road was near Woodend, Mo., it struck a place where the rails had been misplaced and the engine left the track and went down a high bank, wrecking itself, killing the fireman and a man who was riding on the engine and injuring the engineman so that he died in a few hours. The train was running very slowly on account of a heavy storm that was prevailing at the time, and none of the cars left the track. Some

men were subsequently arrested and one of them confessed that they had misplaced the rails, intending to rob and wreck the train.

On the night of the 6th a freight train on the Erie Railway was thrown from the track near New Hampton, N. Y., by some ties which had been piled up on the track.

##### DERAILMENTS, UNEXPLAINED AND MISCELLANEOUS.

On the morning of the 1st a car of a freight train on the Missouri Pacific road ran off the track in Leavenworth, Kan., blocking the road some time.

On the afternoon of the 1st, as an express train on the Pennsylvania & New York road was near Wyalusing, Pa., the sleeping coach, at the rear of the train, jumped the track and dragged the forward cars after it. The sleeping coach swung round and went down into the old canal bed beside the track, striking a heavy post as it fell and tearing itself to pieces; the other cars were upset and damaged. Two passengers were killed, two trainmen and 18 passengers more or less severely hurt.

On the evening of the 3d the engine and two cars of an express train on the Central Railroad of Georgia ran off the track at Sparta, Ga., doing some damage.

On the morning of the 5th the engine of a freight train on the New York Central & Hudson River ran off the end of the bridge over the Hudson at Albany, N. Y., the draw being open at the time. It is said that the usual signal was displayed, but the train could not be stopped in time.

On the 20th a freight train on the Little Miami road ran off the track near Valley Mills, O., blocking the road some time.

On the 23d, as a train on the Missouri Pacific road was making a flying switch at Boonville, Mo., a box car jumped the track and was wrecked, tearing up the track badly.

On the morning of the 25th an express train on the Illinois Central road was struck by a tornado near Kankakee, Ill., and all the cars were blown from the track, one being badly broken. Four persons were badly and six slightly hurt.

##### BOILER EXPLOSIONS.

On the morning of the 9th, as a freight train on the New York Central & Hudson River was near Cheektowaga Forks, N. Y., a flue collapsed and the steam rushed out into the cab, scalding the engineman and fireman badly.

On the afternoon of the 22d the engine of a coal train on the Lehigh Valley road exploded its boiler while pulling out of a siding at Shenandoah, Pa. The boiler was torn to pieces, the engine completely wrecked and the fireman and a brakeman scalded. Some small buildings near the track were almost torn down and some of them set on fire.

##### OTHER ACCIDENTS.

Early on the morning of the 3d a car in a stock train on the Grand Trunk Railway caught fire when the train was near Stratford, Ont., and was destroyed, killing several cattle.

On the 20th, as an express train on the Michigan Central road was near Kalamazoo, Mich., one of the parallel rods broke, tearing up one side of the cab and running board and injuring the fireman very badly.

Late on the evening of the 30th, as an express train on the Columbus, Chicago & Indiana Central road was near Knightstown, Ind., running very slowly, on account of a violent storm at the time, a large tree was blown down and fell up the postal car, crushing in one end of it.

This is a total of 49 accidents, whereby 16 persons were killed and 92 injured. Seven accidents caused the death of one or more persons, 13 caused injury less than death, while 29, or 59.2 per cent. of the whole number, resulted in no injury serious enough for record.

These accidents may be classed as to their nature and causes as follows:

COLLISIONS:	
Rear collisions.....	9
Butting collisions.....	7
Crossing collision.....	1
DERAILMENTS:	
Unexplained.....	5
Broken axle.....	5
Broken wheel.....	1
Broken bridge.....	1
Spreading of rails.....	2
Land-slide.....	2
Wash-out.....	3
Misplaced switch.....	3
Rail removed maliciously.....	1
Malicious obstruction.....	1
Open draw.....	1
Wind.....	1
Boiler explosion.....	1
Flue collapsed.....	1
Broken connecting rod.....	1
Car burned while running.....	1
Car wrecked by falling tree.....	1
Total.....	49

Four collisions were caused by mistakes in orders or failure to obey them; three by misplaced switches, one misplaced purposely; three by trains breaking in two and one by a runaway engine. Twelve accidents are traced directly to defects or failures of road or equipment. The one broken bridge recorded failed on account of the washing out of its abutments by a freshet. Two collisions were between passenger trains, five between a passenger and a freight and 10 between freight trains; 15 derailments were of passenger and 12 of freight trains, and of the other accidents two occurred to passenger and three to freight trains.

As compared with June, 1876, there was a decrease of three accidents and of three in the number killed, and an increase of 19 injured.

Nothing in the month calls for special remark except the very small number of accidents and the absence of some causes usually plentiful at this season, especially cattle on track. The number of collisions is proportionally large.

For the year ending with June the record is as follows:

	No. of accidents.	Killed.	Injured.
July.....	79	17	69
August.....	78	22	76
September.....	106	41	133
October.....	103	40	115
November.....	96	23	128
December.....	88	94	141
January.....	147	10	148
February.....	95	5	41
March.....	58	9	31
April.....	60	13	34
May.....	46	12	41
June.....	49	16	92
Totals.....	975	302	1,066

The averages per day for the month were 1.63 accidents, 0.63 killed and 3.07 injured; for the year they were 2.67 accidents, 0.83 killed and 2.90 injured. The average casualties per accident for the month were 0.327 killed and 1.877 injured; for the year, 0.310 killed and 1.083 injured.